The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Overseas Chemical Trade Figures

THE returns for August of overseas chemical trade reveal an all-round decrease of rather alarming proportions, following on declines for previous months. The only reflection with any comfort in it is that we must be nearing the lowest point in the curve, and that any change in the near future is likely to be a change for the better. It is satisfactory to a certain degree to see that the imports are nearly as much down as the exports, which indicates at least a general restriction of trading activity rather than a weakening in our exports alone. It is noteworthy, too, that the decline of £522,794 in chemical exports is explained largely by a few big items, rather than by an all-round decline. For example, there is a rather striking change in the figures relating to sulphate of ammonia. Japan, which absorbed £145,811 in August of 1929, has taken only £11,109 in August of this year; the export to Spain and the Canaries has fallen from £115,016 to £72,494, and to China from £82,298 to £38,043. As against this, however, exports to unspecified "other countries" have risen from £82,514 to £123,352. The sulphate export trade has been for some time developing at a rather remarkable pace, and the present check, it is hoped, will prove only temporary. Sulphuric acid exports, a commodity regarded as a good index to trade generally, are down from £6,404 to £2,340. Coal tar products show a decline from £84,491 to £38,061, tar and creosote oils alone having fallen from £51,138 to £9,483. There is a decrease in glycerine exports from £48,117 to £17,385, in drugs, etc., from £254,087 to £204,465, in dyestuffs from £92,239 to £85,360, and even so stable a section as painters' colours and materials has dropped from £327,728 to £248,621.

These are not particularly pleasant figures, but, as Lord Melchett recently pointed out, the chemical industry is the feeder of an immense number of other industries in the matter of raw materials, and while the industries that absorb chemical products are suffering from depression, the position inevitably reacts upon the chemical industry. Similarly, any general improvement is at once reflected in quickened activity in chemicals. Further, in comparison with the balance of trade in other industries, it is satisfactory to find chemical exports maintaining so favourable a ratio to chemical imports. Yet another point that has a certain comparative interest is the fact that the United Kingdom returns are still better than those of several other countries. The reduction in imports over the first seven months of this year, which in the case of the United Kingdom is 10·2 per cent., is 25·9 for the United States, 12 per cent. for France, 17·8 per cent. for Germany and 21·4 per cent. for Italy. On the export side for the same period the figures are—United Kingdom, 16·4 per cent., United States, 22·6 per cent., France 9·6 per cent., Germany 6·2 per cent., and Italy 20·9 per cent.

Synthetic Shellac

AN interesting point has been reached in the affairs of Brownlac, Ltd., a company that purchased for £60,000 a secret process by which it was claimed that synthetic shellac could be produced at a cost to the company of £50 per ton. The first annual meeting of the company, called for Monday last, was adjourned to allow Mr. Rushton, the vendor, an opportunity of producing the synthetic product under conditions stipulated by the board of directors. These provide that Mr. Rushton and his chemists, the directors and their chemists and technical advisers, and representatives of the shareholders should be present at the test, the raw materials for which appear to consist of a secret compound and other ingredients. The mixture from these materials is to be placed in a sealed package and taken to the Vocalion works to be passed through rollers. The directors asked for the production of 10 lb. of shellac, and Mr. Robert Brownlow, the inventor, undertook to provide the necessary quantity of the secret compound to produce the amount named. Hitherto, it was urged on behalf of the inventor and vendor, the experiments in production had been hampered by the lack of efficient

machinery, and it was felt that a further opportunity, under carefully regulated conditions, should be provided. The shareholders will meet again on October 6 to receive a report on the results.

Scientific Co-operation

It is of interest to note that among new companies just registered is an Association for the Promotion of Co-operation between Scientific and Technical Societies and Institutions within the British Empire. The members of the council include Sir John Cadman, Dr. A. E. Dunstan, Sir Robert Hadfield, Mr. F. W. Harbord, Dr. Herbert Levinstein, Mr. E. Macfadyen, Mr. J. Arthur Reavell, Professor J. F. Thorpe, Sir Arnold T. Wilson, Sir Hugh Bell, Lord Brotherton, and Lord Wakefield. From a statement made by Mr. Reavell, it would appear that one of the chief objects of the association is the erection of a central building in London for housing together a number of scientific societies and institutions, and its registration as a company is a necessary part of the procedure. In other words, it is to be the executive or controlling body for carrying out what was originally known as the "Chemistry House" scheme, but which has gradually grown into one of a more general and less distinctively chemical character.

It will be noticed that the council includes several members who have taken a keen interest in the provision of a central building. Dr. Levinstein, during his presidency of the Society of Chemical Industry, repeatedly referred to the matter. Sir Arnold Wilson is another keen advocate, and is understood to have brought important oil interests within the scheme. The most detailed and comprehensive statement on the whole project yet made public was that by Professor Thorpe in his last presidential address to the Chemical Society. Mr. Arthur Reavell, representing the chemical engineering side, has also given his support to the proposal. The council has an influential and representative membership, and the three great interests included are oil, engineering, and chemistry.

The Institute and Medical Patents

We learn from the current journal of the Institute of Chemistry that, on the action of the Council in representing to the Board of Trade Patents Committee that medical patents should not be treated differently from other patents, it is suggested that this view may be modified when the evidence taken before the Board of Trade Patents Committee is published, particularly in view of the relations between the chemist and the medical man in the discovery and development of new remedies. It is obvious that friendly co-operation between medical and chemical interests is of the highest importance, and it was the hope of the Joint Chemical Committee that the suggested scheme for dedicated medical patents might secure this, while giving reasonable safeguards to the inventor and manufacturer. The attitude of the Institute was that the individual research worker should not be deprived of due reward for the result of his inventions, and this principle, of course, is intended to apply as much to medical men as to chemists. There appears to be some hope, in spite of the different views that have been expressed, of arriving at a general agreement before any change in the existing law is effected.

The Buenos Aires Exhibition

A message of an entirely reassuring character has been received by Mr. Follett Holt, the chairman of the London Committee of the British Empire Exhibition at Buenos Aires in 1931, of which the Prince of Wales is the patron, relating to the progress of the arrangements. Mr. Gibson, the Chairman of the British Chamber of Commerce in Argentina, reports that at an interview with General Uriburu, representing the Argentine Government, the representatives of the Exhibition were received most cordially and were authorised to state that the Exhibition has the full approval and support of the Government. The Argentine Minister of Finance has also expressed in similar terms his goodwill and his desire to assist the enterprise in every way possible. He particularly emphasised the importance of developing commercial relations between the two countries and expressed his approval of the slogan "Buy from those who buy from us." These interviews have strengthened the confidence of the organisers in the success of the Exhibition and their reliance on the goodwill and active support of the Government. "Conditions in the Argentine," the message adds, "are tranquil; business as usual. Every confidence is manifested by the public in the new Government, which has been recognised by the Supreme Court."

Books Received

Prospectus of University Courses in the Municipal College of Technology, Manchester. Session 1930–31. Manchester University.

The Royal Technical College, Glasgow. Calendar 1930-31. Pp. 440.

The Calendar

Sep. 15–20	Iron and Steel Institute: Autumn Meeting.	Czechoslovakia.
17–20	Society of Glass Technology: Second Glass Convention	Peak Buildings, Terrace Road, Buxton.
22, 23 and 24	Ceramic Society. Joint Meeting of the Refractory Materials Section and Building Materials Section. 2.30 p.m.	Building Trades Exhibition, Olympia, London.
Sep. 29 to Oct. 1	Faraday Society: General Discussion: "Colloid Science Applied to Biology."	The Laboratory of Physical Chemistry, Free School Lane, Cambridge.
6	Iron and Steel Institute: Additional Autumn Meeting. 7.30 p.m.	Cleveland Technical Institute, Middlesbrough.
7	Iron and Steel Institute: Additional Autumn Meeting. 7.30 p.m	Metallurgical Club, Sheffield.
7	Iron and Steel Institute: Additional Autumn Meeting. 7 p.m.	Secondary Schools, Doncaster Road, Scunthorpe.
10	Iron and Steel Institute: Additional Autumn Meeting. 7 p.m.	Royal Metal Exchange, Swansea.
17	Iron and Steel Institute: Additional Autumn Meeting. 7.15 p.m.	Royal Technical College, Glasgow.
22	British Science Guild: Alexander Pedler Lecture. "Science Discipline." Sir David Prain. 5.30 p.m.	Liverpool.
22 & 23	Institute of Fuel: Conference.	Institution of Electrical Engineers, Lecture Theatre, Savoy Place, London.
	Annual Dinner and Dance. 6.45 p.m.	Connaught Rooms, London.

A Note on the Dyestuffs Industry

By Professor H. E. Armstrong

HAVING entered upon the Field of the Cloth of Gold which is Chemistry under the guidance of the great Hofmann—spiritual father of W. H. Perkin, the founder (1856) of the Synthetic Dye-Stuff Industry; also of Nicholson of Magenta fame; of Crookes, the creator of modern fourth-state physics—in 1865, less than 10 years after the miracle of "Mauve" was upon record, I have little short of complete cognizance of the marvellous story the industry presents. It is an unparalleled story of discovery, inventive genius and determination, of labour and great expenditure, so profound in its inner meaning as to be within reach of but few ordinary mortals. I have known all the chief actors in the great dyestuff drama. It should be made clear to the world, on an occasion like the present,* that modern speculations even upon atoms and stars are altogether puerile compared with the vast body of fact brought to light in the study of dyestuffs. It were time that the chemist asserted his right to notoriety, if such be desirable. Far better, however, is the sense of satisfaction he has in knowing that his cloth has been of supreme service to the world in every direction. To state these things is permissible, in order that it may be made clear that chemistry is a subject of public concern. Full support of the Dyestuff Industry is essential, because it is our highest school of constructive chemistry on the organic side. If we lose it, we inevitably lose our place in chemistry. In every way, the industry is more than deserving of support, if only from this point of view.

A Failure of the Counting House

Thirty-five years ago, addressing the Chemical Society, in my section of the Hoffmann Memorial Lecture, in dealing, though but briefly, with the Dyestuff Industry, I deplored its then condition in our country compared with that of the German industry. I then said:—

"The records of our Society show what English chemists can accomplish and, if the demand should arise, there would now be no difficulty in finding and educating any number of capable men who could do all that would be required of them; but so long as employers of labour are not thoroughly imbued with the scientific spirit and fail fully to avail themselves of the services of properly trained workers, no real progress is possible."

I then held and still hold the opinion, that our early failure to establish the industry as a British industry, including Perkin's own ultimate failure, was a failure of the counting house, not of the laboratory: a commercial, not a technical, failure. The commercial side was never made scientific, that is to say, it never had full knowledge and understanding of the work it controlled and therefore could not lead it or make proper use of the workers.

The British Chemist

My forecast remained unverified up to the time of the late war. Then, as all know, being forced to make a supreme effort, managerial inefficiency being put aside, we were soon able to show that we had chemists among us able to compete with the disciplined and highly trained force brought into the field by our opponents. We surprised ourselves, in fact.

After the war, when the misnamed man of affairs again assumed control, we muddled along under direction of lawyers and others incompetent to have charge of work of so entirely special and technical a character. Our vessel was almost a wreck upon the rock of incompetence; when salved, it was at least guided into harbour by an anthracene beacon most courageously laid down in a northern latitude.

Although, in my considered opinion, still needing no little improvement in management, the industry has now been developed in our country in a way to show that people like myself were fully justified in our estimate of the ability of British chemists to carry on the industry here as effectively as it can be carried on by anyone or anywhere. That the nation must grant it every necessary and proper measure of support is beyond question.

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* Dyestuffs Discussion at the British Association meeting at Bristol.

Chemical Education in India

Dr. R. F. Hunter's New Appointment

MR. ROBERT F. HUNTER, D.Sc., Ph.D., has been appointed Director of Chemical Laboratories and Professor of Chemistry in the University of Aligarh, India. Mr. Hunter received 1st class Honours in the B.Sc. examination at the Royal College of Science in 1924, M.Sc. and Ph.D. in 1925 and 1926 respectively. In 1926 he also received the British Ramsay Memorial Fellowship which he held at the Imperial College, and in 1928, he acted as a demonstrator in the Organic Chemistry Department. In 1929 he was appointed Lecturer in Organic Chemistry in the Brighton Technical College, and he received his London D.Sc. at the beginning of this year. His publications include some 25 papers, most of which have appeared in the Journal of the Chemical Society, and are concerned with the unsaturation and tautomerism of heterocyclic compounds, the bromination of thiocarbamides, the syntheses of thiazole derivatives, the chemistry of organic perbromides, and the syntheses of mustard oils and thiocarbamides by means of thiophosgene. He also prepared certain specimens for the Chemical Warfare Committee some years ago, and was associated with Dr. Renshaw and Dr. Dyson of the Laboratory of Applied Pathology, Manchester, in certain chemotherapeutic researches for some years.

The Aligarh College was founded by Sir Syed Ahmad, K.C.S.I., LL.D. in 1875, and rapidly acquired fame as a seat of Mahommedan learning and as the nucleus of a future Muslim University. Some 11 or 12 years ago, the Aligarh College received its charter as the Aligarh University, and with the general realisation of the necessity for improving the laboratories and scientific teaching there, the foundation stone of a College of Science within the University was laid down in 1927. The new Chair to which Mr. Hunter has been appointed forms part of this new scheme, and has been founded as a result of a generous donation which the Muslim University has received. Mr. Hunter's first task will be to build new and extensive chemical laboratories which will be second to none in India. In fact, one of the main troubles at Aligarh at present is that although the original chemical laboratories were quite adequate for the needs of the College before it became a University, they are now badly overcrowded. The B.Sc. class usually numbers about 100, the Intermediate class about 200, and in addition to this, Honours, Degree and M.Sc. students have to be accommodated.

Evening Courses in Chemistry

A NEW course of lectures and laboratory work on modern methods of Analytical Chemistry is to be given under the L.C.C. evening education scheme at the Hackney Technical Institute, Dalston Lane, London, during the coming session. The opening lecture will be delivered by Mr. A. Chaston Chapman, F.R.S., on September 24, on "Some Recent Advances in Analytical Chemistry," and subsequent lectures by Dr. J. Grant.

At the Borough Polytechnic, Borough Road, London, there are to be special technical classes in synthetic resins, moulding, materials and plastics on Tuesday and Thursday evenings commencing on September 30, the lecturer being Mr. L. M. P. Bell. A series of ten lectures on "Synthetic Resins, their Chemical, Physical and Mechanical Properties," is being given by Mr. W. D. Owen of the Electrical Research Association, on Wednesday evenings from October 1.

At Battersea Polytechnic, Battersea Park Road, London, a chemical engineering course will be given on Monday and Friday evenings during the coming winter, commencing on Monday next. Lectures will be given by Mr. H. Griffiths, B.Sc., M.I.Chem.E., and practical laboratory instruction under the joint direction of Mr. Griffiths and Mr. C. W. Davies, M.Sc., A.I.C.

Linseed Oil Production in Greece

THE output of linseed oil in Greece for the year increased to 1,280,000 kilos, having a value of 20,000,000 drachmas, compared to 1,035,000 kilos, having a value of 20,070,000 drachmas the preceding year. Imports, on the other hand, declined; the respective quantities for 1928 and 1929 were 205,300 kilos, value 3,448,800 drachmas and 136,570 kilos, value 2,264,900 drachmas.

Formation and Properties of Boiler Scale

By Dr. Everett P. Partridge

An important investigation of the problem of Formation and Properties of Boiler Scale, by Dr. E. P. Partridge, has been published by the Department of Engineering Research of the University of Michigan (Pp. 170, price one dollar). The following extracts taken from the Bulletin (Engineering Research Bulletin No. 15, June, 1930) give some idea of the comprehensive treatment of the subject.

About the time of the American Revolution, James Watt invented the condensing engine working at a steam pressure of 5 or 6 pounds per square inch above atmospheric pressure. By 1800, Richard Trevithick had developed the Cornish boiler producing steam at pressures of 25 pounds or slightly higher. By 1900, boiler pressures had risen to 200 pounds; by 1925 to 440 pounds. In the latter year, boilers were installed to operate at 660 pounds, and the following year a plant was built to use the then astounding pressure of 1,400 pounds. To-day in Europe there are preliminary installations of Benson boilers operating at the critical pressure of water, 3,200 pounds per square inch.

The capacities of individual boilers and the rates of firing have increased as markedly in the last thirty years as have the boiler pressures. During this period of rapid development in boiler design and operation, certain troubles experienced since the first use of the steam boiler have suddenly been magnified. Foaming or priming of boiler water, corrosion of boilers and auxiliaries, and the formation of scale on boiler heating surfaces have become problems of the greatest importance, and have engaged the earnest attention of numerous men working from both the practical and the theoretical viewpoints.

Fundamental Research Needed

The problem of boiler scale has attracted perhaps more than its share of attention, but in the large amount of work done there has been relatively little fundamental study of the processes of scale formation, or of the properties of scale, most of the effort having been directed, quite reasonably, toward the prevention rather than the understanding of the undesirable phenomenon. As a result of this, there are to-day several well-developed methods of scale prevention and a host of others that are extremely dubious. Further development now waits upon fundamental research in which the physical chemist, the chemical engineer, and the mechanical engineer must co-operate. Such fundamental research should not be developed from the restricted viewpoint of boiler scale alone, nor of boiler corrosion alone, but should recognise the interrelated and oftentimes opposed demands of all of the factors in successful boiler operation.

The discussion of heat losses due to scale leads to the conclusion that these losses are relatively small, since theoretical calculations are well supported by the data of competent contemporary investigations in placing them at a figure of not greater than 2 per cent. for scales of ordinary thickness and heat conductivity. While the loss in boiler efficiency due to scale is small, the fact that there is any loss at all would still justify the application of scale prevention methods. Contemporary boiler operation demands the elimination of all losses up to the point of maximum economy of operation. The prevention of scale by adequate chemical control would be sound economics even if boiler efficiency were the sole consideration. Actually, however, there is another factor which is growing in importance as boiler pressures and rates of driving steadily increase. This is the failure of tube surfaces due to overheating as a result of scale formation.

In boilers of contemporary design, the front-row and water-wall tubes are exposed to severe radiation, with total heat input rates of the order of 70,000 to 100,000 B.t.u. per square foot per hour. Scale forming in these tubes will not materially reduce the rate of heat input, but will cause an increase in the metal temperature proportional to the increased resistance to heat flow from the metal to the water within the tubes. It is in just these regions, however, that scale forms first and grows most rapidly, as was early observed by Couste.

For the present, the point should be emphasised that the heat transfer conditions which make for the most rapid growth of scale are precisely those which will cause the maximum increase in the temperature of the boiler metal as the result of scaling.

A rather unpleasantly frequent phenomenon accompanying the development of higher pressures and higher ratings in contemporary boiler operation has been the apparently inexplicable failure of tubes exposed to direct radiation. A possible explanation of some of these failures is apparent from the previous sample calculations. An amount of porous silicate scale which would have been considered no scale at all ten years ago is here seen to be sufficient to raise the tube metal above the danger point at high rates of radiation. Other causes, such as the formation of a continuous steam film on the wall of the tube, may eventually be found to account for some of these cases. It seems very evident, however, that boiler scale, as an almost universal concomitant of boiler operation, may be blamed for a good share of the trouble.

Heat Conductivity

Generally it may be said that boiler scales have low heat conductivities; the maximum value of the heat-conductivity coefficient is approximately 2·0 B.t.u./ft.^{2}-hr.-ft.-°F. Dense, compact scales, such as are typically formed by calcium sulphate, show an average value of approximately 1·3, while very porous scales may have coefficients as low as 0·05. The extremely low conductivity of porous scales is due to the fact that, during actual boiler operation, the interstices are filled with steam, forming what is, in effect, a vapour film mechanically held on the boiler heating surface. The high resistance of vapour films to heat flow is well known.

While boiler scale is a material with low heat conductivity, its effect upon heat utilisation is slight. Older figures for heat loss due to scale range up to 15 per cent. loss for $\frac{1}{16}$ inch of scale, but it is probable that the actual loss is not more than 2 per cent. The latter figure is supported not only by theoretical calculations, but also by the result of recent experimental investigations.

Even though scale has a less serious effect on boiler efficiency than was formerly believed, scale formation upon boiler heating surfaces exposed to direct radiation has a serious effect on the elevation in metal temperature. Rates of heat transfer by radiation of 75,000 B.t.u./ft.^{2}-hr. or over have been estimated for front-row and water-wall tubes in contemporary installations. With such high rates, deposits of non-porous scales of the order of thickness of 0·05–0·10 inch will cause failure of tubes by overheating, while extremely porous scales of one-tenth the thickness may produce the same result. Since increase in boiler pressure decreases the allowable margin of elevation in the tube temperature, the problem of scale prevention will become continually more important as boiler pressures and ratings increase.

Constituents of Boiler Scale

Chemical analysis and crystallographic examination of boiler scales indicate that calcium sulphate in the form of anhydrite, calcium carbonate in the form of calcite, magnesium hydroxide in the form of brucite, and magnesium silicate and calcium silicate are the most common constituents, while calcium carbonate in the form of aragonite and calcium hydroxide are occasionally present. The solubilities of the three forms of calcium sulphate of magnesium hydroxide and of calcium hydroxide are known in the boiler temperature range. All of these scale-forming substances decrease in solubility with temperature increase. It is highly probable, as indicated by Frear and Johnston, that the solubility of calcite likewise decreases as the temperature is raised, the partial pressure of carbon dioxide being held constant. The solubility of calcite at a given temperature also decreases, with decrease in the partial pressure of carbon dioxide. While no information is available concerning calcium and magnesium silicates, it is believed that these substances also show solubility curves with negative slopes. If this assumption is granted, the generalisation may be made that all of the substances commonly occurring in boiler scale are characterised by negative solubility slopes.

The question of solubility equilibria in the complex solutions presented by the water in boilers during actual operation may probably be treated most accurately and most simply from the standpoint of activities rather than from that of ionic concentrations. Work is in progress at the present time in an attempt to define Hall's carbonate-sulphate ratio in terms of activities as a function of the ionic strength of the boiler water.

The different systems of boiler-water treatment may be classified under two main heads :—1. Those developed for treatment of feed-water previous to its introduction into the boiler. 2. Those developed for direct treatment of the water within the boiler during operation.

In the first group of boiler-water treatment systems are included both the distillation of boiler make-up and the processes involved in the softening of natural waters by the precipitation or replacement of undesirable ions.

Distillation of Make-up

Central stations and other large plants in which nearly all of the steam made is condensed and returned as feed water to the boilers may be economically justified in using evaporators to supply distilled water to make up the inevitable small losses. Carefully controlled systems of this type have made fine records ; for example, the Trenton Channel plant of the Detroit Edison Co. is operated without blowdown. At the time of the annual inspection the water is emptied from the boilers, and new distilled water is used to start them up again. Typical conditions in the boilers after varying periods of operation are indicated by the following figures :

Boiler No.	Water Evaporated million lbs.	Period of Operation hrs.	Total Dissolved Solids p.p.m.
1	595	3,066	128
2	636	3,281	100
6	646	3,328	246
7	948	4,885	360
8	341	1,708	226
9	448	2,309	216
11	729	3,759	214

Admission of raw water by some accident, such as priming of evaporators or an undetected leak in a condenser, may, however, raise havoc with a plant designed for operation on distilled water. In addition, while the problem of scale prevention may be solved for the boilers themselves, scale formation in a less dangerous but troublesome form must be faced in the operation of the evaporators.

In general, the evaporation of make-up water has certain definitely limited applications, considered both from the economic and the technical viewpoints. The majority of plants must have recourse to some other means of feed-water treatment or boiler-water conditioning.

Precipitation of Undesirable Ions

The nearly complete removal of calcium and magnesium salts from a water by precipitation is possible by the use of a number of chemicals, but practical choice is limited by present cost consideration to lime, soda ash, and possibly barium carbonate. Addition of lime to a bicarbonate water causes the precipitation of calcium carbonate and magnesium hydroxide ; addition of soda ash to a water containing calcium sulphate precipitates calcium carbonate ; barium carbonate, while itself only slightly soluble at a low partial pressure of carbon dioxide, will, when added to a sulphate water, cause the gradual precipitation of still less soluble barium sulphate and calcium carbonate. Since most natural waters contain both bicarbonate and sulphate, there have been developed combined systems of softening such as the lime-soda and the lime-barium processes, in which the relative amounts of the reacting chemicals are so adjusted as to produce the maximum removal of undesirable ions.

Partial removal of calcium and magnesium from a bicarbonate water may be obtained by purely thermal means. Increasing the temperature of the water in a properly designed and adequately vented feed-water heater or de-aerator disturbs the bicarbonate-carbonate equilibrium by removing dissolved carbon dioxide. Calcium carbonate and, to some extent, magnesium hydroxide, are precipitated, the completeness of removal being increased by increase in temperature' increase in duration of the heating period, more effective contact of the water with the atmosphere in the heater, and decrease in the partial pressure of carbon dioxide in this atmosphere. The water tends, however, to remain somewhat supersaturated with respect to the substances precipitated.

The chemical reaction involved in any of these softening processes proceeds at a definite rate towards a condition of equilibrium. By raising the temperature, the rate of reaction is increased and the equilibrium is shifted in a direction determined by the solubility slope of the solid phase precipitated ; by increasing the concentration of the reacting chemical the final equilibrium is shifted toward more complete precipitation of the slightly soluble substance comprising the solid phase. Increase in temperature is quite practicable, since the heating of feed water is dictated by other independent considerations. Any considerable increase in the concentration of the reacting chemical is, however, limited by technical as well as by economic considerations. In the case of lime or soda softening, or of the combined lime-soda process, any excess of chemical must necessarily increase the ultimate concentration of hydroxyl ion in the boiler water. High alkalinity is, however, undesirable since it is believed to be responsible for the type of boiler-metal failure designated as " caustic embrittlement." The uncontrolled use of lime in softening may, in addition, lead to the formation of calcium hydroxide scale in a boiler using the overtreated water.

The use of barium carbonate offers a difficulty quite in contrast with the problems arising from over-treatment. Barium carbonate is so slightly soluble at a low partial pressure of carbon dioxide, that it has been considered most practicable to use it as a softening chemical by maintaining it in suspension in the water being treated, and to increase the barium ion concentration as much as possible by means of a lime pre-treatment somewhat in excess. The increase in the concentration of calcium ions thus produced in the water tends to depress the solubility of calcium carbonate, while the increase in hydroxyl-ion concentration tends to swing the equilibrium towards barium hydroxide rather than barium carbonate, with a resultant increase in concentration of barium ion. An alternative means of securing this same end with a combined lime-barium process would be to place the lime treatment after the treatment with barium carbonate, and to use carbon dioxide derived from stack gases to swing the equilibrium towards the more soluble bicarbonate. While this would apparently require the use of additional lime in proportion to the carbon dioxide added to the water, less excess of lime would be necessary, and the total lime requirement would be only slightly higher, while the alkalinity of the boiler feed water would be lowered.

Hot-Process Lime-Soda Softener

In the hot-process lime-soda softener, advantage is taken of the fact that the rate of reaction is increased by an increase in temperature. An additional advantage accruing from the use of higher temperatures is the tendency toward thermal decomposition of bicarbonates due to the decrease in solubility of carbon dioxide with increase in temperature. Even in a hot-process softener, however, there is a minimum time required for the precipitation of calcium carbonate. If the necessary time is not allowed, the water passing from the softener to the boiler will be supersaturated with respect to calcium carbonate and also possibly with respect to magnesium hydroxide, and is likely to form a rapidly-growing dense scale in the lines between the softener and the boiler, as well as in the boiler near the point of introduction of the feed.

The hot-process lime-soda softener operated under competent control at a proper rate can be made to produce a feed water containing from 5 to 15 parts per million of calcium and magnesium ions, although some ordinary operating figures run up to more than twice the latter figure. With sufficient blow-down such a feed water will prove satisfactory for many installations at pressures up to 200 lb. gauge or even somewhat higher. At pressures in excess of 200 lb., however, it is advisable to supplement the external softening with internal conditioning by means of phosphate, as suggested by Hall in 1925. Internal conditioning with phosphate is covered by Hall's domestic and foreign patents.

Barium compounds other than the carbonate are too expensive at the present time to allow their general use in water softening operations of any considerable magnitude.

(To be continued.)

British Chemical Overseas Trade for August

Decline on Last Year's Figures

A DROP in chemical exports of over half a million pounds compared with the figures for the corresponding month last year is recorded in the Board of Trade returns of British overseas trade for August. Chemical Imports totalled £1,194,669, or £441,733 less than during August, 1929, exports £1,515,778 (£522,794 less) and re-exports £69,138 (£15,255 less). Over the full eight months of the year there are declines of £1,643,546 in imports and £1,711,264 in exports compared with the corresponding period of 1929.

Imports

	Quantities Month ended August 31,		Value Month ended August 31,	
	1929.	1930.	1929.	1930.
CHEMICAL MANUFACTURES AND PRODUCTS—	Tons		£	£
Acetic anhydride ..cwt. / Acid Acetic ......tons	2,113	216 / 1,133	72,782	687 / 43,791
Acid Tartaric......cwt.	2,695	3,059	18,683	18,640
Bleaching materials „	17,208	9,061	12,616	8,769
Borax .... „	22,477	22,956	13,882	13,805
Calcium Carbide ... „	75,953	71,727	45,594	44,445
Coal tar products value	—	—	110,289	26,969
Glycerine, Crude ..cwt.	1,259	1,717	2,253	2,661
Glycerine, Distilled. „	1,216	1,498	2,810	3,335
Red Lead and Orange Lead ....cwt.	2,530	3,626	4,666	5,556
Nickel Oxide ...... „	86	171	402	891
Potassium Nitrate (Saltpetre) ....cwt.	13,667	6,409	13,713	5,960
Other Potassium Compounds ....cwt.	416,029	450,556	174,590	165,576
Sodium Nitrate.... „	10,550	24,403	5,414	11,777
Other Sodium Compounds ....cwt.	41,079	28,165	29,266	18,105
Tartar, Cream of .. „	3,466	1,764	16,103	7,455
Zinc Oxide ....tons	913	672	25,675	18,307
All other Sorts....value	—	—	413,272	242,108
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts ....oz.	169,136	58,779	12,304	4,167
Bark Cinchona (bark Peruvian, etc.)...cwt.	1,953	859	7,082	3,261
Other Sorts .... value	—	—	291,520	135,637
DYES AND DYESTUFFS—				
Intermediate Coal Tar Products........cwt.	187	63	2,243	690
Alizarine.......... „	58	6	2,395	370
Indigo, Synthetic .. „	—	—	—	—
Other Sorts .... „	4,306	4,277	89,816	98,859
EXTRACTS FOR DYEING—				
Cutch ....cwt.	5,197	6,496	9,076	12,777
Other Dyeing Extracts cwt.	2,190	922	6,126	3,872
Indigo, Natural ... „	56	2	1,346	60
Extracts for tanning „	50,918	111,375	50,338	114,380
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground ..cwt.	54,402	45,854	12,042	9,784
White Lead (Dry) . „	13,742	11,928	23,803	19,617
All other Sorts..... „	138,762	123,354	166,301	152,358
Total of Chemicals, Drugs, Dyes and Colours .....value	—	—	1,636,402	1,194,669

Exports

	Quantities Month ended August 31,		Value Month ended August 31,	
	1929.	1930.	1929.	1930.
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Sulphuric ...cwt.	25,879	7,323	6,404	2,349
Acid Tartaric...... „	2,097	825	15,490	5,231
Ammonium Chloride (Muriate) ....tons	365	353	6,850	6,166
Ammonium Sulphate— To Spain and Canaries tons	13,144	10,389	115,016	72,494
„ Italy .... „	359	345	3,379	3,290
„ Dutch East Indies tons	50	744	460	5 548
„ China (including Hong Kong)tons	8,685	5,042	82,298	38,043
„ Japan ...... „	16,180	1,498	145,811	11,109
„ British West India Islands and British Guiana tons	661	726	6,021	5,275
„ Other Countries „	9,271	17,580	82,514	123,352
Total........... „	48,350	36,324	435,499	259,111
Bleaching powder ...cwt.	55,417	46,416	15,063	13,403
COAL TAR PRODUCTS—				
Anthracene ....cwt.	—	3	—	2
Benzol and Toluol..gall.	18,864	6,602	2,052	631
Carbolic Acid......cwt. / Cresylic Acid .....gall.	cwt. / 9,699	977 / 93,533	14,426	2,582 / 11,573
Naphtha........... „	5,484	2,738	566	301
Naphthalene ......cwt.	3,328	1,765	1,453	859
Tar Oil, Creosote Oil, etc. gall.	1,918,563	504,876	51,138	9,483
Other Sorts ....cwt.	20,465	24,668	14,856	12,630
Total..........value	—	—	84,491	38,061
Copper, Sulphate of ..tons	406	1,001	10,074	24,560
Disinfectants, Insecticides, etc. ....cwt.	37,760	31,644	84,721	73,819
Glycerine, Crude ....cwt.	5,279	3,096	11,629	5,430
Glycerine, Distilled... „	14,903	5,057	36,488	11,955
Total........... „	20,182	8,153	48,117	17,385
POTASSIUM COMPOUNDS—				
Chromate and Bi-chromate ....cwt.	2,281	2,018	4,238	3,944
Nitrate (Saltpetre) . „	886	573	1,689	1,095
All other Compounds „	780	3,361	10,061	11,823
Total........... „	3,947	5,952	15,988	16,862
SODIUM COMPOUNDS—				
Carbonate, including Soda Crystals, Soda Ash and Bi-carbonate cwt.	390,709	365,088	109,441	96,038
Caustic .... „	172,553	166,770	112,313	108,204
Chromate and Bi-chromate ....cwt.	2,985	2,919	4,761	4,660
Sulphate, including Salt Cake ....cwt.	326,031	105,148	34,205	12,345
All other Compounds „	60,833	49,388	61,317	64,659
Total........... „	953,111	689,313	322,037	285,906
Zinc Oxide ....tons	176	271	6,520	7,782
Chemical Manufactures, etc., all other Sorts value	—	—	313,264	226,697
Total of Chemical Manufactures and Products (other than Drugs and Dyestuffs) ...value	—	—	1,364,518	977,332
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts ....oz.	170,308	183,477	17,479	16,962
All other Sorts....value	—	—	236,608	187,503
Total.......... „	—	—	254,087	204,465
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	12,147	6,249	83,839	67,336
Other Sorts .... „	7,617	18,213	8,400	18,024
Total........... „	19,764	24,462	92,239	85,360
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground ..cwt.	4,668	98	2,008	51
White Lead (Dry) . „	2,984	2,637	6,379	4,916
Paints and Colours in Paste Form .....cwt.	35,113	27,347	69,145	52,487
Paints and Enamels Prepared (including Ready Mixed) ....cwt.	46,861	37,671	151,897	117,033
All other Sorts..... „	52,228	44,397	98,299	74,134
Total........... „	141,854	112,150	327,728	248,621
Total of Chemicals, Drugs, Dyes and Colours .....value	—	—	2,038,572	1,515,778

Re-exports

Chemical Manufactures and Products—	Quantities Month ended August 31, 1929.	1930.	Value Month ended August 31, 1929.	1930.
Acid Tartaric......cwt.	103	48	819	308
Borax .... ,,	1,014	2,174	1,118	1,241
Coal Tar Products.value	—	—	20	12,862
Potassium Nitrate (Saltpetre) ....cwt.	55	81	83	106
Sodium Nitrate ... ,,	18	581	13	298
Tartar, Cream of .. ,,	467	285	2,285	1,458
All other Sorts.....value	—	—	26,456	12,796
Drugs, Medicines, etc.—				
Quinine and Quinine Salts............ oz.	9,409	2,225	1,084	237
Bark Cinchona.....cwt.	338	191	3,093	1,860
All other Sorts....value	—	—	37,877	26,682
Dyes and Dyestuffs—				
Cutch ....cwt.	811	1,796	1,311	3,756
All other Sorts..... ,,	612	83	2,536	765
Indigo, Natural ... ,,	5	2	135	50
Extracts for Tanning ,,	534	3,085	699	3,812
Painters' Colours and Materials......cwt.	9,744	834	6,628	2,767
Total of Chemicals, Drugs, Dyes and Colours	—	—	84,393	69,138

Overseas China Clay Trade

Imports during August

The following is the return of the quantity and value of China Clay, including china stone, imported into Great Britain and Northern Ireland in the month of August:

Countries Whence Consigned.	Quantity. Tons.	Value. £
Germany	10	96
Portugal	30	48
U.S. America	8	51
Total	48	195

Exports

China Clay, including Cornish or China Stone, exported from Great Britain and Northern Ireland during August was as follows:

Country of Destination.	Quantity. Tons.	Value. £
Finland	343	1,013
Sweden	1,498	3,621
Norway	630	1,175
Poland (including Dantzig)	7	22
Germany	4,427	9,712
Netherlands	2,905	6,452
Belgium	8,388	13,715
France	2,984	6,490
Switzerland	20	67
Spain	2,067	4,830
Italy	353	915
Bulgaria..........................	2	23
Roumania	2	10
China	55	217
United States of America	13,106	28,883
Mexico	60	232
Peru	15	72
Brazil	—	4
Argentine Republic	500	2,025
Union of South Africa.............	8	103
British India	231	1,008
Madras	2	6
Bengal, Assam Bihar and Orissa	128	486
Australia	3	18
New Zealand	2	15
Canada............................	131	523
Total	37,867	81,637

Processes of Glass Manufacture

America's War-Time Development

"Processes of Glass Manufacture" was the subject of an address delivered to the Salford Technical and Engineering Association on Saturday last by Mr. L. M. Angus-Butterworth, formerly of the Department of Glass Technology of Sheffield University. Lancashire, he said, was by far the greatest glass-producing area in the country. At the time of the 1921 census, the total number of glass-workers in England was 44,500, and of these 14,800, or nearly one-third, were to be found in Lancashire. The two chief centres of the glass industry within the county boundaries were St. Helens and Manchester and Salford. It had been estimated recently that the annual coal consumption of the Lancashire glassworks was over 229,000 tons, and that the county produced more than 161,000 tons of glass yearly.

Glass-making had now become largely an engineering proposition, except for the making of fine tableware. For many centuries methods remained virtually unchanged in the industry, and it was only about the time of the outbreak of the Great War that interest in the use of automatic machinery for glass manufacture became thoroughly aroused.

It was not possible for the manufacturers in Europe to make much progress during the war years, but America, on the other hand, was able to develop the mechanising of her glass manufacture almost without interruption, and drew far ahead of any other nation in this respect. Shortly after the war American experience and knowledge began to be applied in England and the rest of Europe, and, together with local enterprise and inventiveness, completely revolutionised the glass industry in the course of a very few years. Powerful aid was also given by the research work of the Glass Department of the University of Sheffield, which had been established during the war. From being an interesting but antiquated handicraft, the making of glass had changed suddenly into a most efficient modern industry.

Mr. Angus-Butterworth described in detail, with the help of lantern slides, the most recent processes for the manufacture of bottles, sheet and plate glass, illuminating ware, glass tubing and rod, table glass, etc.

Mr. Joseph Connolly, who moved a vote of thanks to the lecturer, said that although before the war certain kinds of laboratory and optical glassware could not be made in this country, British glass was to-day equal to and often better than any other.

Industry in Latvia

Progress of Chemical and Allied Trades in 1929

Chemicals, minerals and oils formed 10·3 per cent. of the total imports into Latvia during 1929, states the *Board of Trade Journal* in the course of a review on that country's trade position. Only 8·6 of Latvia's requirements from abroad were obtained from the United Kingdom, Germany supplying 40 per cent., but she exports more of her produce to this country than to any other.

No new industries of importance have been established recently, although the amount of capital invested in existing industries has increased and their output has grown. Glass making and brick making have both done good business, and the growth in building has also stimulated the paint trade. The one local cement factory, which is protected against foreign competition by high import duties, was unable to meet local requirements, and cement imports have accordingly increased. The production of machinery and ironware continues to grow, mainly as a result of increased Soviet orders. The output of chemicals and linoleum has fallen slightly. The match industry has developed considerably as a result of the agreement concluded with the Swedish Match Trust, and exports have doubled. In 1928 the industry was granted a monopoly by the State.

About 47,700 tons of superphosphate were manufactured. Spirit distilleries suffered considerably owing to high prices of raw materials, and only a small part of the existing distilleries operated last year. Large quantities of spirits were accordingly imported by the Government (who control the industry).

Preservation of Rubber Goods by Antioxidants

By T. L. Garner

The author in this article discusses the preservation of rubber goods by antioxidants, dealing with the testing of antioxidants, the protection of tyre rubbers and other products, and the general theory of antioxidation.

ALTHOUGH rubber goods can be manufactured which will last many years under ordinary conditions, it has been found necessary to incorporate antioxidants to help the rubber to withstand special conditions which have arisen of recent years. Rubbers are now developed to withstand high temperatures and frequent flexing, and it has been found that under such conditions the working life can be greatly prolonged by incorporating a suitable antioxidant. Commercial vehicles carrying very high loads generate such great heat in their tyres that often it is impossible to hold one's hand against them after the vehicle has finished a long journey. In addition, tyre treads are repeatedly flexed and there is grave risk of cracking with the hard high carbon stocks used to-day, unless some antioxidant is incorporated in the mixing used.

It must not be supposed, however, that because it is only in recent years that extended use has been made of these compounds that they are of recent origin. A German patent was taken out in 1908 protecting the use of aniline as a preservative for rubber, and there seems no doubt that samples protected by the addition of hydroquinone were made as early as 1914. Since that time, and especially in recent years, numerous patents have been taken out covering many types of chemicals for use as antioxidants. In general, however, the latter are either amines, phenols, or aldehyde-amine condensation products. It is in the last group that most of the commercial antioxidants are to be found.

Testing of Antioxidants

The best type of mix for evaluating an antioxidant is a simple accelerated one, such as:

Rubber	100
Sulphur	3½
Zinc oxide	3
Diphenylguanidine	1
Antioxidant	½–1%

For general comparative purposes such a mix offers advantages over a more highly compounded one, and a mix containing no organic accelerator is liable to give misleading results. If the antioxidant itself possesses accelerating properties, these must be allowed for in vulcanising the sample. An ideal antioxidant, however, should have no appreciable effect upon the physical properties of the mixing, especially as regards rate of cure, since it is often desirable to incorporate the antioxidant into an established mixing without the necessity of making adjustmetns to correct the rate of vulcanisation of the mix.

The mix containing the antioxidant and a similar one minus the latter should be tested side by side, before and after ageing, for the usual physical properties of tensile strength, elongation, etc. The ageing may be natural, but is usually done in either the Bierer-Davis Bomb or Geer oven in order to carry out the test in a reasonable time. Having eliminated any antioxidants which give markedly inferior results in this test, the satisfactory products must be examined in a mix of the type intended in service—for example, a tread rubber.

Taking this particular case, it is not sufficient that the antioxidant preserves the rubber against degeneration by heat; it must also give protection against cracking caused by repeated flexing of the stiff rubber. For testing this, specially designed machines are used, one suitable type continually bending small samples of the rubber through 90° until a crack appears.

Most antioxidants give some kind of stain in white mixings on exposure to light; this may vary from a light yellow or grey shade to a pronounced brown discoloration. It is unfortunate that, in the writer's experience, the better the antioxidant for general purposes, the more the staining which occurs when it is used in light coloured rubbers. The exact discoloration occurring in coloured goods will, of course, depend upon the shade imposed by the particular antioxidant, but, generally speaking, blues and greens are more affected than reds, the former fading badly with many antioxidants. Naunton (*Trans.* I.R.I. *V*, 5, 317, has disagreed with the use of the term "fading" in this connection, since the change in colour is due to the impressed yellow shade, and also states that further exposure to light will restore the original colour. While there is some improvement in all cases on prolonged exposure, the latter statement is not correct for many antioxidants. The manufacturer of rubber goods looks at the effects through the eyes of his customers who are apt to return rather hastily a faded mat or other article, without waiting to see if the colour later improves! It must also be noted in connection with the staining trouble that the mix containing the antioxidant will stain other rubber (and other products) with which it may come into contact, and may easily make its appearance through a quarter of an inch of rubber containing no antioxidant. As an example of this kind of staining, the rubber on a batting glove containing certain antioxidants will stain the fabric of the glove.

The general application of these substances is essential in rubber which must stand heat for a prolonged time; they also arrest oxidation during the vulcanisation of goods cured in dry air. Faulty mixing and overcure are also covered up to some extent by the use of antioxidants, for there is no doubt that all good antioxidants will prolong the life of an overcured article to a greater or lesser extent. Most antioxidants are not particularly effective in checking the cracking caused by the sun's rays, although there are available certain types which the manufacturers claim to be far more efficient in this connection than is paraffin wax. The latter is well known for its protective action, which is entirely physical, due to the exuding of the wax to the surface, giving a protective coating.

Protection of Tyre Rubbers

It is now usual for all tread rubbers to contain about 1% by weight of raw rubber of an antioxidant, which affords some resistance to cracking by repeated flexing on the road. It is unfortunate that the higher the percentage of carbon black present in a tread the greater the tendency to cracking, both in ageing and also on the road, and it is necessary to afford some protection even in the best of compounded mixings. The phenomena of splitting are not related to the process of oxidation, and the value of an antioxidant in this respect is therefore not shown by the usual tensile strength figures before and after ageing. Suitable antioxidants are also an advantage in casing mixings, but they tend to give a dry surface on exposed material more quickly than is shown if they are absent. Some antioxidants are much worse in this respect than others.

General Mechanical Goods

Apart from special purposes, such as belting, where a good antioxidant to increase resistance to flexing is required, the chief value to be gained from antoxidants in mechanical goods is protection from overcure. Generally speaking, a normally cured article in which an organic accelerator has been used will continue to cure up slowly for some time, and this is the reason why rubber goods are sometimes stiffer after some months than a few days after vulcanisation. If, however, the article is cured to show its maximum physical properties it cannot improve on ageing, and if the overcure is not excessive may have begun to revert. Where over-vulcanisation cannot be avoided, therefore, a good antioxidant is incorporated to prevent rapid development of deterioration.

General

The point to be watched in connection with the staining of antioxidants in rubber compounds has already been mentioned, and also the care which must be exercised in choosing an antioxidant for a brightly coloured article.

In addition to the usual types of antioxidant, certain accelerators have distinct antioxidant properties, and the value of these in this respect must be taken into account in considering their use; on the other hand, it is generally found that accelerators with pronounced beneficial effect upon the ageing properties, *e.g.*, aldehyde amines, cannot be used in brilliantly coloured goods.

Various theories have been advanced to account for the action of antioxidants. Ditmar concludes that basic com-

pounds disaggregate colloidal rubber, the disaggregation being of a temporary character with a volatile base, and that there is a return to the aggregated state with the evaporation of the base. With less volatile bases the dispersing effect is more permanent and the elasticity and good tensile properties are in general preserved. Rubber, being a negative colloid, it will remain in a more stable colloidal state in the presence of bases, and basic preservatives have therefore the effect of preserving this stable dispersion. There seems no evidence to support or contradict this logical theory, which indicates a certain amount of reversion, possibly balanced by the tendency of progressive vulcanisation. Some accelerators which are claimed to have good ageing properties, *e.g.*, ethylidine aniline, cause reversion even before all available sulphur has been used up.

Protection from Phenolic Bodies

The phenolic bodies which act as protectors because of their greater avidity for oxygen as compared with rubber, termed "antioxygens" by Moureu and Dufraisse, protect any organic compounds which ordinarily undergo oxidation. The use of tannin has already been mentioned. The oxygen-acceptor is held to be capable of existing in two forms, one reactive to oxygen and the other non-reactive, the function of the antioxidant being to catalyse the transformation from the former to the latter. Taylor, however, suggests the formation of a loose molecular compound of the protectors, rubber and oxygen, and reactant without change in the rubber.

The third group, which is the most important commercially, have no theory covering their application, except for those already mentioned, but in view of the fact that they catalyse the formation of a layer of insoluble rubber on the surface of raw rubber exposed to air and light, thus forming a polymerised oxidised layer, which largely protects the rubber underneath from attack, it is suggested that possibly in cases of exposure of vulcanised rubber a similar oxidised protective layer is formed. It is recognised, however, that such a theory could not explain decomposition by heat alone, but in such cases reversion can be brought about in the absence of oxygen and is another phenomenon. Although light is necessary to produce this insoluble layer in the case of raw rubber, a comparatively disaggregated product is there being dealt with, the action of the light being polymerisation under the protected conditions. With vulcanised rubber the highly polymerised product is already present, and it is therefore possible that this protective layer would be formed in the absence of light, thus accounting for the protection afforded by antioxidants against oxidation in the absence of light. This is supported by the fact that efficient protection is afforded by antioxidants when goods are dipped in suitable solutions and where the effective action is confined to the surface layer.

Big Potash Find in Spain

Extensive beds of potash, discovered in the north of Spain by prospectors of the Geological Institute, have proved to be from 25 ft. to 30 ft. in thickness, and to lie at an average depth of about 300 ft. from the surface. Some of the beds extend to a length of 1,800 ft. or more. The deposits lie in an area bounded by Burgos in the west, Lerida in the east, Logromo and Huesca in the north, and Saragossa in the south. The extreme length of the field from east to west is 250 miles, while the distance across varies up to 80 miles.

To prevent any speculative "ramp" and to protect the landowners and workers in the area, the Government has suspended the registration of mines throughout the field and the State will exploit the deposits. These discoveries add considerably to the already vast natural resources of Spain.

Italian Consumption of Coal Tar Pitch

The production of coal-tar pitch in Italy is increasing, having grown from about 8,800 tons in 1921 to about 40,000 tons in 1929. Consumption is almost entirely in connection with the making of briquettes of which the State Railways are the principal consumers, and depends upon the rate of production of briquettes. There are no accurate statistics for the importation of pitch into Italy, but according to a U.S. estimate the consumption averages around 60,000 tons annually, of which 30 per cent. is of domestic origin and the rest imported, three-quarters from Germany and the balance from England.

Value of Research Laboratories in Industry

Example of the United States

A notable tribute is paid to the value of research laboratories in American industry in the course of a survey by the Standard American Corporation, which estimates that $100,000,000 is being spent annually by industrial organisations in this form of development. Industrial research was described as a powerful factor in contests for business and in meeting foreign competition.

"Owing to their superior research facilities," says the report, "the larger industrial corporations of the nation are to-day in a stronger position than ever before, and their activities in this direction make it possible for them to keep up with changing conditions, so that there is little danger of the larger industrial units suffering from obsolescence of their products or substitution of new inventions and new methods."

Analysis of the nation-wide study shows that more than 600 industrial concerns have departments engaged in research work. They are estimated to be spending more than $75,000,000 each year in this field, and have invested millions of dollars in research facilities.

"Many large American industrial organisations can trace their success almost entirely to scientific research," states the report. "Only in a few instances have the industrial research departments failed to produce a considerable profit to the manufacturer, and in scores of instances the ratio of profit to the amount expended has ranged from 100 to 1,000 per cent.

"The indications are that during the next few years research will play an even greater rôle in the development of industry, as many concerns are planning to increase materially their budgets for this work in 1931."

Salt Production in Canada

Increased Figures for 1929

The Dominion Bureau of Statistics at Ottawa estimates the production of salt in Canada in 1929 at 330,264 tons valued at $1,578,086, an increase of 10·3 per cent. in quantity and of 5·5 per cent. in value over the 1928 total of 299,445 tons, worth $1,495,971. Deliveries in 1929, exclusive of the salt content of brine used in the manufacture of chemicals, averaged $8·70 per ton as compared with $8·28 per ton in the previous year.

An increase of 8 per cent. was recorded in Ontario's production, the total for 1929 being 302,445 tons, or 91·6 per cent. of the Canadian production. The output from the Malagash mine in Nova Scotia continues to advance, and the 1929 production was 42 per cent. higher than the total in the previous year. Canadian imports of salt decreased 6·6 per cent. to 176,566 tons, with a value of $936,820. Salt exports from Canada totalled 9,359 tons, valued at $70,762, as compared with 2,930 tons, worth $36,399 exported last year.

Capital employed in the salt industry by the eight firms operating in 1929 totalled $4,576,543. The cost of fuel and electricity used during the year was $249,664, this total including $226,552 paid for 51,808 tons of bituminous coal.

Chemical Co-operation

It is announced, in the journal of the Institute of Chemistry for August, that the Council have given consideration to a motion, submitted by Dr. Herbert Levinstein, that the scope and activities of the Institute and its Local Sections should be reviewed, having regard to the interests of other Chemical Bodies. At the same time, a suggestion was received from the Council of the Chemical Society that a Joint Committee, consisting of representatives of the Chemical Society, the Society of Chemical Industry, and the Institute, should be appointed to explore a number of suggestions regarding the sectional meetings of the Institute and the Society of Chemical Industry, and other matters directed to the provision of still closer co-operation between the three bodies. Professor Smithells, past president, Mr. Patrick H. Kirkaldy, hon. treasurer, and Dr. H. McCombie were appointed as representatives of the Institute, and it was also decided to invite the views of local sections on the matter.

The Catalytic Oxidation of Hydrocarbons

Some Unsolved Difficulties

RECENT literature on this subject, and more especially the comprehensive review by Dr. Ernst Zerner in the *Chemiker Zeitung*, would seem to indicate that, although hydrocarbons—paraffin and other mineral oils—can be more or less easily oxidised and converted into fatty acids, the characteristic smell in the resulting products is so persistent that no really effective means have yet been found for removing or disguising it. From the soap maker's point of view the oxidised products are nearly hopeless, except perhaps in the manufacture of industrial or technical soaps in which a strong smell may not be a serious drawback. For other purposes, too, the material may be of value, and this particular branch of research, which has now been carried on for many years, is still of very considerable interest.

War-Time Research

In 1917 the German Oils and Fats Committee had practically decided that the problem of oxidising hydrocarbons into a suitable fat substitute was insoluble, but in less than a year after some degree of success had been achieved. The Swiss patent of the Chem. Fab. Troisdorf had been published, also the work of Bergmann, and the dissertation of Dr. Sabine Eisenstein (Karlsruhe, 1918). The last named used manganese stearate as catalyst, and the air or oxygen was preferably moistened. There is deep brown coloration, probably due to colloidal solution of manganese peroxide in paraffin, but this soon clears and a dark-coloured manganese precipitate was thrown down, accompanied by separation of water and acid vapours. Oxidation then proceeds and the saponification number increases. If 1 per cent. manganese stearate is used as catalyst and oxygen is blown in at 125° C., after two hours the saponification number is 26, and after 18 hours it is 232, the acid number being 108. There is thus a wide difference between saponfication and acid number, namely, in the ratio of 2 : 1, and it therefore follows that there is in the reaction product a large amount of esters, anhydrides, lactones, etc. There is also simultaneous increase in specific gravity, since not only the fatty acids but also the esters have a higher specific gravity than the original paraffin. The reaction is strongly exothermic, and if large quantities of material are used the temperature rises markedly, and cooling is necessary from time to time. There is also some risk of explosion when large amounts of oxygen are used, but not with air, and in this latter case the reaction proceeds much more slowly.

Different Catalysts Tried

In the work carried out by Drs. Granichstadten, Fuchs, Zerner and others in the Research Department of the Central Soap and Candle Works, the apparatus used consisted essentially of a long narrow tube closed at the bottom, with an inlet tube reaching to the bottom, a gas outlet tube, and a thermometer. Complete conversion into fatty acids does not take place, and a large proportion of unsaponifiable is always present, as follows :—

Sapon. No.	Unsaponfiable per cent.
29	86
150	46
240	24
265	26
328	22
261	17

Several different catalysts were tried, including the stearates of Al, Ba, Cr, Pb, Fe, Mn, Co, Ni, Cd, Zn, Hg, U ; the oleates of Mn and Zn ; manganese resinate, linoleate, borate ; barium peroxide ; stearic and other fatty acids, tallow, rape oil and other fats and oils, turpentine, glycerine, sugar and many other substances. It was shown that the catalyst was not specific, and although there were, of course, certain differences in the reaction velocity, such differences might appear with the same catalyst under apparently similar conditions. Only those catalysts which contained a metal, especially manganese, started the reaction at lower temperatures, 110–115°, whereas free acids like stearic acid could only start it at 135° C. Variation in the amount of catalyst between 0·1 per cent. and 5 per cent. made little appreciable difference. This fact and consideration of the so-called incubation period shows that the true catalyst is only formed in the reaction itself, and its initial form and amount is apparently largely immaterial. Actually the reaction mixture contains a substance which, although it does not react with potassium iodide and sulphuric acid, yet discolours indigo sodium sulphate. Possibly it is a peroxide which at ordinary temperatures is stable for at least 24 hours. And even after this length of time a reaction mixture, which has once become active, when added in small amount to fresh paraffin, is capable of causing rapid oxidation. The reaction may even be brought about without catalyst, starting at a temperature of 150–160°, and continuing at 120° to a finish. This being so, it is rather remarkable that the oxidation of hydrocarbons has not been more successfully accomplished sooner, and it is probably due to the fact that sufficient allowance has not been made for the incubation period, but more especially to working with shallow instead of deep layers of material.

The chief reaction product is an oily or unctuous liquid with a coconut-like smell and a very light, almost white, colour. There is also a small amount of an oily distillate with a distinctly acid smell, and an aqueous distillate also with acid reaction. A charcoal tower connected up with the reaction vessel absorbs the volatile matter given off, and the escaping gas is thus almost completely deodorised, and only colours concentrated sulphuric acid slightly yellow, even after long exposure. With a saponification number of 150 the following yields are obtained : 103 per cent. of the chief reaction product, 2·5 per cent. of the oily distillate, 5·5 per cent. aqueous distillate, and 5 per cent. weight increase in the charcoal. Leaving out the aqueous distillate the total yield is 110·5 per cent. The carbon dioxide was also determined by absorption in soda lime. With oxidation up to a saponification number of 200 it only amounted to 2 per cent. of the weight of the original material. Oxygen absorption was determined by periodical burning of the reaction product. With a saponification number of 179 (unsaponifiable 43·3 per cent.) the oxygen absorbed was 11·7 per cent. ; with a saponification number of 243 (unsaponifiable 26 per cent.) the oxygen absorption was 15·4 per cent.

Discoloration

The reaction product, which was often snow-white in the closed vessel, turned to a reddish-brown colour when saponified and at the same time acquired a distinctly unpleasant smell. It reduced ammonia potash silver solution, but these reducing substances are not the cause of the discoloration when saponified, for this appears even after the reducing substances have been removed by shaking up a benzine solution with sulphite lye. By boiling with hydrogen peroxide the discoloured reaction products are certainly bleached, but after saponifying the dark colour reappears.

Removal of the unsaponifiable from the reaction product is rather difficult, as when the soda soap is extracted with benzine strong emulsions are formed and the benzine soon loses its extractive power. This can be avoided by addition of alcohol. Unsaponifiable can often be more effectively removed by saponifying up to 200 and then extracting with alchool (6 to 10 per cent. of the weight of soap) for forty hours at 50° C. If the reaction product is saponified and the resulting soap left to stand in the warm a large proportion of the unsaponifiable separates out on the surface and can be skimmed off. The rest remains dissolved in the soap, and despite many attempts it was not found possible to simplify its removal in the manner above described. With a saponification number of 175 there was ultimately obtained 40 per cent. unsaponifiable, and 60 per cent. fatty acids, of which two-thirds were water-insoluble and one-third water-soluble. The unsaponifiable may be further oxidised, giving an even darker product than the original raw material. The portion, however, skimmed off as above gives somewhat better results. The fatty acids free from unsaponifiable are dark-coloured, semi-solid, of agreeable coconut-like smell, with the following constants :

Saponification No.	236, 241, 238
Acid No.	196, 192, 199

The soaps are hard, compressible, dark-coloured, difficultly lathering, and with a disagreeable and penetrating smell.

They cannot be salted out, owing doubtless to their oxyacid nature. By treatment with petroleum ether it was possible to separate the fatty acid mixture into two parts, the one with a less and the other with a greater oxyacid content, although even the portion soluble in petroleum ether contains considerably more oxygen than would conform with a normal fatty acid constitution.

In order to avoid discoloration when saponified the fatty acids may be distilled in vacuo or steam. This greatly improves their colour and that of the soap, but there are heavy losses of material, and the distillation yield is only 70 per cent., of which the first fraction passing over (about one-sixth of the whole) is liquid and gives a satisfactory good lathering soda soap. The rest of the distillate yields a hard, poorly lathering soap. On saponifying the distilled fatty acids there is only very slight discoloration observable. The change in colour usually observed in saponifying paraffin oxidation products may be avoided to some extent by a different method of oxidising, namely, by adding small quantities of alkali or alkaline reacting substances, and by working with chemically inert vessels such as glass or enamelled iron. Care must be taken not to add too much of such material or the reaction does not go.

In every case the disagreeable smell persists in the soap, and is the more remarkable in view of the fact that the actual oxidation product from paraffin has an agreeable coconut-like smell, according to Zerner. Attempts to remove it by distillation or otherwise have so far failed, and several other methods have been tried in vain, such as partial extraction with various solvents, partial saponification and removal of unsaponifiable, separation by partial freezing, treatment with absorption agents, fractional high vacuum distillation, conversion into various salts, and separation by varying solubilities. All these and other methods have so far failed, but effective means may yet be found for making these oxidation products suitable for soap making, and in the meantime they should be of interest from other points of view.

British Colour Council

Board of Management Appointed

THE first step towards launching the British Colour Council scheme was taken on Tuesday with a meeting in London of subscribers to the memorandum and articles of association of the Council, which has been registered as a company limited by guarantee and without share capital. The subscribers appointed a strong and generally representative board of management, including spokesmen for the dyestuffs and dyeing and piece goods industries, the wholesale merchants, makers-up and model houses, the retail model houses, the retail distributors, the millinery trade, boot and shoe manufacturers, tanners, and various other interests.

Lord Ebury was appointed president of the board, which will elect its chairman and vice-chairman at its next meeting on October 7 and at the same time will probably appoint a number of committees to carry on the work of the Association. The board consists of 27 members, with power to increase its numbers to 30, and possibly an effort will be made to increase the representation of those especially qualified to give advice on the world tendencies of colour.

Several members of the board, as appointed on Tuesday, are the nominees of trade organisations. Those representing the dyestuffs and dyeing interests are: Cecil J. T. Cronshaw (Dyestuffs Group, Imperial Chemical Industries, Blackley, Manchester); C. B. Gwynn (Bradford Dyers' Association, Ivy House, Newgate Street, London); J. K. McCallum (J. and J. McCallum, Laighpark Dyeworks, Paisley); W. Rhodes (Scott and Rhodes, Yeadon, Yorkshire); and John Sharp (Bradford Dyers' Association, 39, Well Street, Bradford).

Synthetic Resins in Sweden

GERMANY at present has a practical monopoly of the market for synthetic resins in Sweden, but indications are that firms of other nations should easily be able to compete with German products of this kind. During the past few years, there has been a definite and constant demand in Sweden for synthetic resins, and in 1927 and 1928, the latest years for which statistics are available, 98 to 99 per cent. of the total imports originated in Germany.

Indian Chemical Notes

(FROM OUR INDIAN CORRESPONDENT.)

INVESTIGATIONS have been made into the value of vegetable rennet in the Punjab by the Government Agricultural Chemist, as a substitute for rennet prepared from the stomachs of calves. This work was undertaken because cheese is a milk product of high nutritive value and a large section of the Indian people is deprived of its use owing to religious scruples. Of the several plants examined, the best was found to be the ripe berries of *Withania coagulans*, which grows wild in the Punjab plains. The extract from its ripe berries is rich in rennet, and by repeated precipitations the active principle has been obtained in a very pure condition. One part of this preparation is sufficient to coagulate 1,000 parts of milk in one minute.

Other Experiments

Among other experiments may be mentioned the following: A study of the factors contributing to the loss of potatoes during storage has shown that the phenomenon of rotting is accompanied by a decrease of albuminoid nitrogen and an increase of ammoniacal nitrogen almost to the same extent. The Plant Biological Chemist has undertaken an investigation into the occurrence of symbiotic nitrogen fixing organisms within the roots of the rice plant. The Physical Chemist continued to investigate the base capacity of the soil. A new method of dispersing soils for mechanical analysis has been worked out and a new percolating cylinder for measuring the permeability of soil to water devised.

Bikaner's Progress

The State of Bikaner, like its sister State Mysore, is making good progress in chemical industries. The latest event of importance is the opening of a glass factory on modern lines. Bikaner sands have long been known to be particularly useful for glass manufacture but have hitherto remained unexploited. The present enterprise has good prospects and with its success new private enterprises will be started. Other projects in view include the manufacture of cement from sands. The colliery at Palana has proved a successful enterprise.

Fertilisers in Bihar

The Agricultural Department of Bihar is carrying out carefully-planned field experiments, which are gradually adding to the knowledge of the requirements of the various crops in different parts of the province. Special attention is being devoted to the determination of the most profitable nitrogen-phosphate ratios. The use of ammonium sulphate and of such manures as "Ammonphos," is steadily increasing. The various fertiliser firms have now close on 100 agents for the sale of fertilisers, mainly ammonium sulphate, in the province.

Research at Dehra Dun

Considerable research work in chemistry is being done at the Dehra Dun Forest Research Institute every year. For this purpose, the Institute is divided into several branches. The latest report states that large additions have been made to the equipment of the Timber Testing Section. The drum box testing machine was one of such additions, and box tests have been started to accumulate data relating to the boxes at present accepted as standard in the trade. This information will serve as a reference datum for the test of Indian-made boxes. A new type of specimen holder for impact tests has been invented and put into use. It has proved so satisfactory that it has been adopted by other testing laboratories and by at least one manufacturer of impact testing machines.

Wood Preservation Experiments

The experimental work done under this section related to the determination of optimum conditions of treatment for: (1) Chir (*pinus longifolia*); (2) blue pine (*pinus excelsa*); (3) spruce (*picea morinda*); (4) sal (*shorea robusta*) sapwood; (5) deodar (*cedrous deodara*) sapwood. In the case of chir important results have been obtained, and a treatment specification was evolved which enables chir sleepers containing different percentages of sapwood to be treated together in one charge with less oil consumption than formerly, and at the same time with a considerably more uniform and thorough penetration of the oil into the sleepers.

The Chemical Society

Arrangements for 1930-1931 Session

ARRANGEMENTS announced by the Chemical Society for the 1930-1931 Session include the following :

The ceremony of unveiling the Perkin Memorial Plaque, to be presented to the Society by the Perkin Memorial Fund Committee, will take place in the meeting room of the Society on October 16. The plaque is to be unveiled by Mr. A. J. Greenaway and received by the President. Professor W. N. Haworth will deliver an oration on the life and work of Professor W. H. Perkin.

The annual chemical dinner will be held in the Connaught Rooms, Great Queen Street, London, on Thursday, November 6.

The Third Liversidge Lecture by Professor Harold B. Dixon, F.R.S., on "The Thermal Ignition of Gases," will be delivered at the Imperial College of Science, South Kensington, on November 27.

The Second Pedler Lecture, entitled "Studies on Biological Oxidation," by Dr. H. Wieland, has been fixed for the end of February or early in March, 1931.

The ninetieth annual general meeting of the Society will be held in the Society's Rooms on March 26, 1931, and will be followed by the Anniversary Dinner at the Hotel Victoria.

Measuring Apparatus

Some Recent German Developments

IN addition to the general scientific lectures organised at the Achema VI Exhibition of Chemical Apparatus held at Frankfort-on-Main in June last (CHEMICAL AGE, Vol. XXIII, p. 101), a considerable section was devoted to lectures on chemical and physical measurements in laboratory and works.

The lecture by Dr. Busse of the C. H. F. Müller A.G., dealt with the use of "X-ray tubes for the examination of materials," in particular with the use of tubes for fine structure, possessing a line or cross focus, and of tubes for coarse structure in which the discharge chamber is constructed of chromium steel and not of glass, as is usually the case. Mr. Adolf Kerr, of Richard Seifert and Co., Berlin, continued with this topic in his lecture on the "Application of X-rays in technical examination of materials." Dr. Löwenstein, of the Vereinigung Göttinger Werke, Göttingen, discussed "Further improvements in analytical balances, high temperature furnaces and apparatus for visual conductivity titrations." "A patented polarisation apparatus" was described by a representative of the instrument manufacturers, Fabrik Steindorff and Co., Berlin. "The rapid determination of the moisture content of materials by measurement of the dielectric constant" was outlined by Dr. Rüter, of Frankfort, who asserted that the Deka-apparatus of Heilan G.m.b.H., Frankfort, was an ideal instrument for scientific investigations on absorption of water, molecular association, and dipole moments as well as for the general examination of materials.

The lecture by Mr. Heinrich Zöll on "New interferometers" was concerned with the Jamin interferential refractor, which measures the smallest differences in refractive indices between solid, liquid and gaseous substances, and with the interferometer by Meissner, which, as it enables changes in length amounting to about 1/10,000 mm. to be measured, is of great importance to biological and physical chemistry. Both instruments are manufactured by Dr. Steeg and Reuter, Homburg vor der Höhe. "The aims and methods of measurement of surface tension" was the title of the lecture by Dr. Cassel, Berlin, in which the new apparatus of the firm of Ströhlein and Co., G.m.b.H., Düsseldorf, was described and demonstrated.

"A simple optical pyrometer for temperatures up to 2000° C.," manufactured by Ströhlein and Co., Düsseldorf, was described by Dr. Lebus. "The measurement and automatic regulating of temperature" was dealt with by Mr. H. Fuchs of W. C. Heraeus G.m.b.H., Hanau. "The simultaneous determination of carbon dioxide and oxygen," with the aid of the instruments of the Mono G.m.b.H., Hamburg, was described by Mr. Münzer as a perfectly automatic process for the control of furnaces of all descriptions.

Secret Process for Synthetic Shellac

Further Tests Called For

THE first ordinary general meeting of Brownlac, Ltd., held on Monday at Caxton Hall, London, was adjourned until October 6 to give Mr. Rushton (vendor of the company) an opportunity of producing the synthetic shellac, which he stated could be done, under conditions stipulated by the directors. The conditions provided that Mr. Rushton and his chemists, the directors and their chemists and technical representatives, should be present, and also representatives of the shareholders. The chemists nominated by the directors were to supervise the test from beginning to end, and to take samples of the ingredients other than the secret compound. The material, after mixing, was to be placed in a sealed package and taken to the Vocalion Works and passed through its rollers. The directors asked Mr. Rushton to produce 10 lb. of the material.

Mr. Robert Brownlow (the inventor) gave an undertaking that he would supply the necessary quantity of the secret compound to produce the quantity stipulated.

Mr. S. Harris and Mr. Harvey Dodd were appointed a committee of shareholders to attend the test.

Lieutenant-Colonel G. A. M. Sceales (the chairman), who presided, stated that the company was formed in order to manufacture synthetic shellac in accordance with the secret process claimed to have been invented by Mr. Brownlow, and the company bought from the vendor, Mr. Rushton, the right to use this process for £60,000 in shares. They had had constant assurances by Mr. Rushton and Mr. Brownlow that the delays and difficulties with which they had had to contend would shortly be overcome. The directors considered that the right course to adopt was to liquidate the company in order that there might be distributed among the shareholders the remaining capital, but if even now at the last hour those gentlemen had been able to produce a process capable of doing what the original alleged secret process was claimed to do, he could conceive that shareholders would prefer to attempt to work that process rather than to liquidate.

The directors, it was stated, had called in as consultants two distinguished chemists.

Chilean Nitrate Companies Consolidation

MR. E. A. CAPPELEN SMITH, president of the Anglo-Chilean Consolidated Nitrate Corporation and chairman of the Lautaro Nitrate Co., Ltd., who has been in charge, together with the Chilean Government delegates, of the negotiations leading to the consolidation of the Chilean nitrate companies into the Compania de Salitre de Chile (Cosach), has authorised the following statement :—

"Arrangements for placing the new company in operation are proceeding most satisfactorily and with all practicable rapidity. The law creating the company is in effect. The boards of directors of the 30 companies which will be consolidated into the new company, representing approximately 94 per cent. of the industry, have signified their intention to participate. The by-laws of the new company are being formulated. As soon as these by-laws have been completed and the company organised, the various companies will be requested to convene their shareholders formally to approve their participation. At the time these shareholders' meetings are called a full statement will be made giving all details."

Manchester Corporation and Rubber Works

JAMES WILSON AND CO., textile waterproofers, of Kemp Street, Ancoats, Manchester, have announced their intention of choosing new premises outside the city for their rubber mixing and vulcanising works, because the Public Health Committee will not grant an unrestricted licence for what is scheduled as an "offensive trade." Under the Public Health Act, 1925, the Corporation will not grant a permit for such a trade except for a specified period—in Manchester's case five years. The Corporation state that their regulations are not strict compared with other cities and that the clause would never be operated unless the works were creating a definite nuisance, but the firm declares that it cannot take the risk of a conditional agreement.

From Week to Week

VOL. VIII of the *Guide to Current Official Statistics* is now on sale (H.M. Stationery Office, 1s. net) and is an expert survey of all the statistics published by the Government during 1929.

THE BANTING RESEARCH INSTITUTE, named after the discoverer of insulin, in connection with the Medical Department of the University of Toronto, was formally opened on Tuesday by Lord Moynihan, president of the Royal College of Surgeons.

CONSTRUCTION OF AN important oil refinery near Rouen, it is reported, is under consideration by the Société Franco-Americaine de Raffinage. The building of the refinery, which would cost about £2,000,000, will depend on the official publication of a Government decree regulating the operation of refineries in France.

A MEETING OF CREDITORS of William Bain, trading as James Templeton and Co., manufacturing chemists, 40, Battlefield Road, Glasgow, S.2, will be held at the office of Mr. John Wallace, certified accountant, Richmond Chambers, 147, Bath Street, Glasgow, on Monday next, when a statement of affairs will be submitted.

OWING TO THE greatly increased demand for their plants, the International Electrolytic Plant Co., of Chester, have acquired larger and more convenient works and offices. After September 27 next the company's address for both works and offices will be :—Sandycroft, Chester. Their telegraphic address will remain unaltered, and the new telephone number will be :—" Hawarden 67."

JAPANESE RAYON PRODUCERS have ordered a 20 per cent. curtailment in output, as productive capacity has been extended too fast. Despite efforts to reduce output, July production passed the three million lb. mark, according to official estimates. Dumping abroad is again in progress, and exports in July assumed proportions which, it is felt, must inevitably affect the position of European producers in export markets.

TUNG OIL SHIPMENTS from Hankow, according to the monthly cable from the U.S. Consul, amounted during July to 13,126,000 pounds, of which 2,728,000 pounds went to Europe and the remainder to the United States. These figures were lower than those for the previous month, but higher than those of July, 1929. Over the first seven months of the present year exports are considerably higher than those for the corresponding period of 1929.

A MEMORIAL to the late Viscount Leverhulme was unveiled in the presence of a large gathering near the Lady Lever Art Gallery at Port Sunlight on Saturday. Contributions to the cost of the memorial had been received from over 22,000 representatives and employees of the firm of Lever Brothers in almost every country of the world, and the unveiling was performed by the oldest employee, Mr. Thomas Peacock, who served with the late head of the firm for 43 yeats.

LORD MELCHETT landed at Southampton on Tuesday at the conclusion of a tour in the United States and Canada. In the course of an interview he stated that there appeared to be a feeling in the United States that the worst of the trade depression was over. The 1929 crash undoubtedly had a sobering effect, and many thoughtful people considered it had been, in spite of its immediate demoralising effect, in some ways a benefit. It was driving people back to the solid basis of work and creation rather than speculation which had come to be almost a disease. Lord Melchett who had sprained his ankle during the voyage, was carried ashore in an invalid chair.

A PUBLIC COMPANY, limited by guarantee, has been registered as " The Association for the Promotion of Co-operation between Scientific and Technical Societies and Institutions Within the British Empire, etc.," and will have charge of the erection of the building in which scientific societies are to be centralised. The members of the council include Sir John Cadman, Dr. A. E. Dunstan, Sir Robert Hadfield, Mr. F. W. Harbord, Dr. H. Levinstein, Mr. E. Macfadyen, Mr. J. A. Reavell, Professor Jocelyn F. Thorpe, Sir Arnold T. Wilson, Sir Hugh Bell, Lord Brotherton and Lord Wakefield. The site of the projected building, it is understood, has not yet been decided on.

TOMSKY, the former Soviet Opposition leader, it is announced, has been removed, at his own request, from his position as head of the Chemical Trust.

A SAFE in one of the principal laboratories in the Sorbonne, Paris, was found to have been broken into last week, and platinum and other valuable metals to the value of £25,000 were missing.

GREAT BRITAIN purchased 1,552, 203 kilos of liquid rosin from Sweden in 1929. Total Swedish exports amounted to 5,622,217 kilos, of which Germany took 1,729,063 and France 1,529,542 kilos.

THE ITALIAN DYE output in 1929 is reported to be 7,400 metric tons, which is an increase of 500 tons over 1928, and maintains the progressive increase in this industry of the past twelve years.

A CONSIGNMENT OF HEROIN, valued at £450 and packed in boxes labelled " borax," was seized by secret police agents at Rotterdam on Monday. The drugs were found to have been manufactured in a Constantinople factory.

SIXTY PEOPLE in various parts of England have suffered from arsenical poisoning as the result of a consignment of boiled sweets being accidentally dusted with arsenic powder. The police last week visited premises in Tunstall, Staffs, and seized a box containing a powder which has been found on analysis to be pure arsenic sufficient to kill 200,000 people.

SPEAKING at the British Glass Convention which opened at Buxton, Mr. Edward Meigh, M.B.E., representing the Glass Manufacturers' Federation, urged that British glass manufacturers should " take the plunge " and dispense with the use of borax, as had been done in several American glass factories. Professor W. E. S. Turner, of Sheffield University, spoke on " Glass technology and industrial progress."

THE MARKET FOR VEGETABLE OILS IN CZECHOSLOVAKIA is the subject of a confidential report prepared by the Department of Overseas Trade from information furnished by the Commercial Secretary, His Majesty's Legation, Prague, and issued to firms whose names are entered on its special register. United Kingdom firms desirous of receiving a copy should communicate with the Department at 35, Old Queen Street, London, S.W.1. Reference Number B.X. 6,751 should be quoted.

THE AMERICAN PETROLEUM INSTITUTION and the American Gas Association will hold the Seventh International Petroleum Congress at Tulsa, Oklahoma, from October 4 to 11, and it is likely to be of special interest to firms engaged in the construction of refinery, pumping, pipeline, storage and other equipment necessary to the working of the industry. Foreign manufacturers are invited to participate and further particulars are available from the United States Embassy, 4, Grosvenor Gardens, London, S.W.1.

THE RUSSIAN superphosphate plant at Konstantinovka has started production, according to a report in the paper " Isvestia." It was originally planned to produce 60,000 tons of superphosphates at this plant, with the intention of increasing the output eventually to 200,000 tons. A rather important demand for fertilisers necessitated a change of plans and the plant was constructed for an initial capacity of 200,000 tons annually, which it is hoped to increase to 300,000 tons in 1931. It is expected that the new plant will practically double the Russian production of superphosphates.

LECTURES ON THE WORK done at Rothamstead by members of this experimental station's staff are being offered to farmers' associations and the various agricultural organisations. Seven lectures by Mr. H. V. Garner, the guide demonstrator, cover " Some principles of manuring," the use of fertilisers on grassland, experiments with sugar beet, manuring of potatoes in the light of recent experiments, nitrogen for cereals, results of Rothamstead experiments on commercial farms, and experience with the newer fertilisers. Other members of the staff, all well-known authorities, offer lectures dealing with soil, micro-organisms, liming and chalking, cause and control of soil acidity, and modern developments in cultivation.

Obituary

MR. WALTER HOWARTH, formerly associated with the Grove Chemical Works, Appley Bridge, until its acquisition by British Glues and Chemicals, Ltd., aged 66.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

332,192. DYE INTERMEDIATES. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, March 15, 1929.

5:8-Dihalogen-1:2-benzanthraquinones are obtained by treating 2-α-naphthoyl-3:6-dihalogenbenzoic acids with non-sulphonating acid condensing agents such as phosphorus pentoxide, phosphoric acid, zinc chloride, or aluminium chloride. In examples the preparation of 5:8-dichloro-and 5:8-dibromo-1:2-benzanthraquinones is described, the condensation being effected in nitrobenzene.

332,203. DYES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 15, 1929.

1-amino-4-halogenanthraquinone-2-sulphonic acids are condensed with aminonitriles of the benzene series, advantageously in presence of an acid-binding medium and a copper catalyst, to obtain products which are acid wool dyes. Thus 1-amino-4-bromoanthraquinone-2-sulphonic acid is condensed with *m*-aminobenzonitrile or with 1-amino-3-cyano-4 (or 5)-methylbenzene in presence of soda and cuprous chloride.

332,208. DYES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, January 15, 1929.

Water-insoluble azo dyes, fast to bucking, chlorine, and light, are produced in substance, on a substratum, or on the fibre by coupling diazotised *o*-aminobenzophenones or derivatives thereof, containing no sulpho, carboxy, or nitro groups, with coupling components such as arylides of 2:3-oxynaphthoic acid or diacetoacetic arylides. In examples, the dyestuff (1) *o*-aminobenzophenone $\rightleftarrows$ diacetoacetic-*o*-tolidide, (2) *o*-aminobenzophenone—→the α-naphthylamide of 2 : 3- oxynaphthoic acid, (3) 4¹-methyl-2-aminodiphenylketone $\rightleftarrows$ diacetoacetic-*o*-tolidide, (4) 4-chloro-2-aminobenzophenone —→the 4¹-chloro-2¹-toluidide of 2 : 3-oxynaphthoic acid, are produced on the fibre, and the dyestuff *o*-aminobenzophenone—→the anilide of 2 : 3-oxynaphthoic acid is prepared in substance.

332,227. STABLE DIAZO COMPOUNDS. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 16, 1929.

Diazonium salts, applicable in dyeing and printing and for combating insect pests, are obtained by reaction of complex metallic fluoric acids or salts thereof with diazonium compounds. Specified acids are the titanium, aluminium, tin, and antimony hexafluoric acids and the antimony and zinc tetrafluoric acids. Various examples are given.

332,246. DESTRUCTIVE HYDROGENATION. C. F. R. Harrison and H. W. Strong, Norton Hall, The Green, Norton-on-Tees, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, April 17, 1929.

In the destructive hydrogenation of coal and other solid carbonaceous materials at high pressures with the aid of a catalyst, an aqueous solution of the catalyst is evenly distributed, preferably by spraying, over the comminuted and agitated material to ensure an intimate admixture of the catalyst with the material. Solutions, preferably saturated, of nickel nitrate or ammonium molybdate, may, for example, be so applied. After draining, the material may be dried and, if desired, mixed with oil, prior to hydrogenation in the usual manner.

332,249. DYES. J. S. Wilson, L. J. Hooley, J. Thomas, and Scottish Dyes, Ltd., Earl's Road, Grangemouth. Application date, January 16, 1929.

Acid dyes for wool, silk, and other animal fibres are made by replacing the halogen in halogenated vat dyes by the sulphonic group by the action of sulphites. In examples, 3:3¹-dichloroflavanthrone, Caledon orange 4R, Caledon orange RRK, and 3 : 3¹-dichlorodianthraquinonedihydroazine are treated in finely-divided form in aqueous suspension with phenol and sodium sulphite.

332,250. EVAPORATING ALKALIES. R. M. Winter, Norton Hall, The Green, Norton-on-Tees, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, January 16, 1929.

Solutions of caustic alkalies are concentrated in vessels having the parts exposed to the solutions constructed of or coated with an alloy of nickel with copper or chromium substantially free from iron. For directly fired vessels a nickel-chromium alloy, *e.g.*, one containing 70 per cent. of nickel and 30 per cent. of chromium, is preferred. For steam-heated vessels a nickel-copper alloy, *e.g.*, one containing 45 per cent. of nickel and 55 per cent. of copper, or containing 20 per cent. of nickel and 80 per cent. of copper, is preferred. Reference has been directed by the Comptroller to Specifications 293,727 (See THE CHEMICAL AGE, Vol. XIX, p. 23 [Metallurgical Section]) and 293,740.

332,251. DESTRUCTIVE HYDROGENATION. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, January 17, 1929.

In processes of destructive hydrogenation of carbonaceous material with the employment of gaseous heating media for heating the charge externally, media having temperatures at least 100° C. higher than the reaction temperature and below 800° C. are used, and provision is made for a uniform flow of heat from the media to the charge. The uniform heat flow is ensured either by the use of scraping means in the reaction tubes or vessels to remove coke deposits, or by arranging a baffle or mantle around the tubes and distributing the heat uniformly in the space between the tubes and the mantle. The effluent heating gases may be mixed with hot gases sufficient to raise their temperature to the desired degree and recirculated. Suitable apparatus is described and illustrated.

332,258. NITRILES. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, March 18, 1929.

Acetonitrile and its homologues are obtained by passing mixtures of acetylene with ammonia or amines over compounds of metals of the second to the seventh group of the periodic system, not reducible under the working conditions, at a rate not exceeding 50 litres of acetylene per hour per litre of catalyst. Suitable catalysts are the mixtures described in Specification 295,276 (see THE CHEMICAL AGE, Vol. XIX, p. 369) and single non-reducible compounds of zinc, aluminium, zirconium, thorium, tin, vanadium, bismuth, molybdenum, and tungsten, preferably supported on silica or alumina gel. The products may be hydrogenated to obtain amines or hydrolysed to obtain acids. Various examples are given.

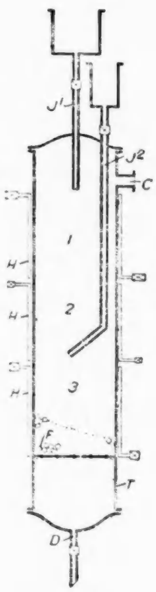
332,259. FERRIC OXIDE. G. E. Seil, 1512, Fayette Street, Conshohocken, Pennsylvania, U.S.A. Application date, April 15, 1929.

An activated ferric oxide, suitable for use as a gas purification material, as a filter and accelerator for rubber, or as a catalyst, is prepared as follows. Iron or iron bearing material, *e.g.*, iron borings, iron ore, or " aniline sludge " is mixed with an alkali or alkaline substance, *e.g.* " fished salt " or sodium and potassium carbonate, either dry or in concentrated aqueous solution, and the mixture is heated either from 200 to 400° C. or from 760 to 1200° C. for 1½ hours, preferably in a rotary kiln. The alkali ferrite produced is quenched in water and ground. The alkaline solution is then filtered off and ferric oxide admixed with some alkali remains. For some purposes, *e.g.* when the product is to be used as a catalyst, the alkaline compounds may be removed by washing.

332,267. ESTERS. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, March 18, 1929.

Glycerol esters of higher fatty acids are prepared by causing

the acid and the glycerol to flow in the liquid phase and in a continuous manner over solid bodies having a large superficial area, while heating and at a pressure below the atmospheric. Known esterification catalysts may be present, *e.g.*, alumina, active carbon, salts of the higher fatty acids as described in Specification 302,411 (see THE CHEMICAL AGE, Vol. XX, p. 81), zinc chloride, or mineral acids. The temperature of the reagents may be increased in the direction of flow of the liquids, and the component of lower boiling point may be initially supplied in excess. In the apparatus shown the tower T is provided with heating units H, internal or external, one for each of the superposed zones, 1, 2, 3, and is charged with bodies F of large superficial area such as rings, balls, or lumps of glass, porcelain, coke, or pumice. One reagent is supplied by a pipe J^1 to zone 1 and the other by a pipe J^2 to the bottom of zone 2. An outlet C near the top may be connected to a source of vacuum. The ester is withdrawn from a bottom outlet D. In an example olive oil fatty acid introduced into zone 1 is esterified with glycerol introduced into zone 2, the temperatures of zones 1, 2, 3 being 160° C., 190° C., and 220° C. respectively, and the pressure being maintained at 15 mm. of mercury. The excess of glycerol is removed, together with the water produced, from the top of the tower.



332,267.

332,316. DYES AND INTERMEDIATES. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 1, 1929.

2-Aroylpyrazolanthrones are obtained by treating 1-halogenanthraquinone-2-carboxylic acids with hydrazine, preferably in presence of a diluent such as pyridine, converting the pyrazolanthrone-2-carboxylic acid obtained into the acid chloride, and condensing the latter with an aromatic hydrocarbon or a halogen derivative thereof Alkylation or aralkylation on the nitrogen atoms of the pyrazole ring may be effected before or after the condensation. Those products which contain a free imino group in the pyrazole ring and a halogen atom in the aryl residue *o*-to the keto group are convertible into vat dyestuffs by treatment with an acid-binding condensing agent such as potassium acetate or sodium carbonate, advantageously in presence of a diluent such as nitrobenzene and/or a catalyst such as copper powder. Numerous examples are given.

332,319. DYES AND DYEING W. W. Groves, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 3, 1929.

Azo dyes are obtained in substance, on a substratum, or on the fibre by coupling diazo, tetrazo, or diazoazo compounds with 4-(2^1-oxy-3^1-naphthoylamino) diphenylamine. Those from tetrazotised dianisidine give dyeings which, when aftercoppered, are faster than those obtained with the corresponding dyes from other arylides. Numerous examples are given.

332,336. DESTRUCTIVE HYDROGENATION. J. Y. Johnson. London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 15, 1929.

Substances of high molecular weight are removed from carbonaceous liquids by adsorbents and destructively hydrogenated together with the adsorbents at elevated temperatures and pressures, and the residue not adsorbed is hydrogenated separately. The use of silica gel and alumina gel as adsorbents is specified; adsorbents which are catalysts for destructive hydrogenation, such as molybdic acid, or which contain such a catalyst, may also be used. In an example a middle oil containing 7 per cent. of constituents boiling at 325–350° C. and 5 per cent. of constituents boiling above 350° C. is treated at 70–80° C. with a silica adsorbent which has been made catalytic by impregnation with a solution of the nitrates of zinc and molybdenum, followed by heat treatment. The middle oil, separated centrifugally from the adsorbent, is destructively hydrogenated at 440–450° C. and 200 atmospheres in presence of a catalyst containing molybdic and chromic acids. It is found that the activity of the catalyst is maintained whereas, without the preliminary treatment with the adsorbent, poisoning occurs rapidly. The mixture of adsorbent and adsorbed substances is hydrogenated at 460° C. and 200 atmospheres, and the low-boiling products obtained are returned to the main process. The adsorbent may be regenerated by heating.

332,359. POTASSIUM NITRATE. P. Höfer and Kaliforschungs-Anstalt Ges., 5, Schonebergerstrasse, Berlin. Application date, June 13, 1929.

Potassium nitrate is obtained by interaction of potassium chloride with the nitrate of a readily hydrolysable metal, such as aluminium or iron. The potassium nitrate separates on cooling the hot mixture. The mother liquor is evaporated with evolution of hydrogen chloride, either until nitrous gases begin to escape or until most of the chlorine has been expelled from the solution, and the original concentration is then restored by addition of water, potassium chloride, and nitric acid or nitrogen oxides. The solution is then cooled, potassium nitrate separated, and the operations repeated.

332,468. CYANAMIDES. N. Caro, 97, Hohenzollerdamm, Dahlem, and A. R. Frank, 138, Kurfürstendamm, Halensee, Berlin, (Assignees of Stickstoffwerke Ges., 4, Schadowstrasse, Berlin). International Convention date October 1, 1928. Addition to 279,812 and 281,611. (See THE CHEMICAL AGE, Vol. XVII, p. 623 and Vol. XVIII, p. 104, respectively).

The reactions described in the parent specifications (for preparing cyanamides of the alkaline earth metals and of magnesium by passing mixtures of ammonia and carbon monoxide over compounds of the metals which form oxides on heating) are carried out in presence of substances which, while they do not decompose ammonia, act as catalysts for the water-gas reaction, *i.e.*, the reaction of carbon monoxide upon water vapour to produce carbon dioxide and hydrogen. Copper, silver, and their salts are suitable. Sulphur compounds, *e.g.*, sodium sulphate, are added to act as catalyst poisons to avoid decomposition of ammonia.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—311,708 (I.G. Farbenindustrie, Akt.-Ges.), relating to manufacture of monoazo dyestuffs, see Vol. XXI, p. 58; 312,173 (I.G. Farbenindustrie Akt.-Ges.), relating to manufacture of glacial acetic acids from dilute acetic acids, see Vol. XXI, p. 90; 313,045 (I.G. Farbenindustrie Akt.-Ges.), relating to recovery of copper from dilute ammoniacal solutions thereof, see Vol. XXI, p. 136; 315,262 (Anglo-Chilean Consolidated Nitrate Corporation), relating to manufacture of sodium nitrate, see Vol. XXI, p. 244; 318,556 (I.G. Farbenindustrie Akt.-Ges.), relating to manufacture of therapeutic agents, see Vol. XXI, p. 480; 318,865 (I.G. Farbenindustrie Akt.-Ges.), relating to inhibiting or reducing the perishing of artificial and natural varieties of rubber, see Vol. XXI, p. 534.

Specifications Accepted with Date of Application

308,687. Extraction of ethylene from ethylene-containing gaseous mixtures. Soc. l'Air Liquide Soc. Anon. pour l'Étude et l'Exploitation des Procédés G. Claude. March 26, 1928.

312,582. Monoazo dyestuffs, Manufacture of. Chemische Fabrik vorm. Sandoz. May 26, 1928.

312,919. Pyridyl alkines and piperidyl alkines, Preparing. A. Boehringer. June 1, 1928.

313,522. Artificial zeolites, Manufacture of. Reymersholms Gamla Industri Aktiebolag. June 13, 1928.

313,562. Polyazo dyestuffs, Manufacture of. Chemische Fabrik vorm. Sandoz. June 14, 1928.

314,060. Carbon bisulphide, Manufacture of. H. Oehme and Chemische Fabrik Kalk Ges. June 23, 1928.

314,423. Case-hardening by nitrogenisation. Electro Metallurgical Co. June 27, 1928.

314,522. Lead alloy for electric cable sheath and other purposes. Standard Telephones and Cables, Ltd. June 29, 1928.

318,107. Vat dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. August 27, 1928.

334,166. Anthraquinone derivatives. H. A. E. Drescher, J. Thomas, and Scottish Dyes, Ltd. February 21, 1929.

334,169. Separation of soluble substances. Imperial Chemical Industries, Ltd. and H. E. Cocksedge. March 14, 1929.

334,178. Making acetylene and other products, Process of and apparatus for. R. G. Wulff. February 25, 1929.

334,184. Polymerisation products from diolefines, Manufacture of. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). May 25, 1929.

334,189. Aliphatic compounds, Manufacture of. British Celanese, Ltd., S. J. Green and R. Handley. May 27, 1929.

334,190. Removing carbonyl-forming metals or carbides thereof from soot. A. Carpmael (*I.G. Farbenindustrie Akt.-Ges.*). May 27, 1929.

334,193. Valuable products from gaseous acetylene hydrocarbons or aldehydes, Manufacture of. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). February 23, 1929.

334,203. Cyclic hydrocarbons from gaseous acetylene hydrocarbons or aldehydes, Manufacture of. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). February 23, 1929.

334,207. Acetic acid, Manufacture of. British Celanese, Ltd., S. J. Green and R. Handley. May 27, 1929.

334,217. 2:4:6-Tribromaniline and its acidyl derivatives, Production of. British Celanese, Ltd. and B. E. M. Miller. May 29, 1929.

334,223. Alcohols from gaseous acetylene hydrocarbons, Manufacture of. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). February 23, 1929.

334,228. Compounds from propylene, Production of. J. W. Woolcock and Imperial Chemical Industries, Ltd. April 30, 1929.

334,240. Vat dyestuffs of the anthraquinone-acridone series, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*). May 30, 1929.

334,241. Cracking of hydrocarbons. H. D. Elkington (*Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij*). May 30, 1929.

334,251. Catalyst masses, Treatment of. British Celanese, Ltd, W. Bader, and E. B. Thomas. May 31, 1929.

334,260-1. Benzyl chloride, Manufacture of. Imperial Chemical Industries, Ltd., N. Bennett, H. Dodd, W. C. Sprent, and F. Holt. June 1, 1929.

334,268. Catalytic material, Production of. Imperial Chemical Industries, Ltd. and J. A. Weil. June 1, 1929.

334,282. Carbohydrate compounds. Manufacture of. A. Carpmael (*I.G. Farbenindustrie Akt.-Ges.*). June 4, 1929.

334,364. Hypochlorites of alkali metals, Preparation of. V. Szidon. August 14, 1929.

334,388. Alkali ethylates, Manufacture of. Dr. A. Wacker Ges. für Elektrochemische Industrie Ges. November 24, 1928.

334,389. Hydrogenation of coal. A. Mentzel October 12, 1928.

334,418. Processes of pickling metals, and materials used therefor. Barrett Co. October 31, 1928.

334,427. Acetaldehyde from acetylene, Production of. G. F. Horsley and Imperial Chemical Industries, Ltd. October 21, 1929.

334,430. Aluminium alloy. H. C. Hall and T. F. Bradbury. October 24, 1929.

334,443. Low-temperature carbonisation of bituminous and oil-bearing materials, Apparatus for. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). November 6, 1929. Addition to 306,723.

334,449. Basic bismuth salts of organic arsenic acids, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 22, 1928.

334,458. Zinc salt solutions, Production of. Metallges. Akt.-Ges. December 7, 1928. Addition to 302,924.

334,466. Metal netting for use as catalyser in contact units. Bamag-Meguin Akt.-Ges. February 8, 1929.

334,474. Monobrominated menthane, Manufacture of. Schering-Kahlbaum Akt.-Ges. December 31, 1928.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

Baly, E. J., Pollopas, Ltd., and Barrows, G. W. Production of solution of urea-formaldehyhe resin and solidified products there-from. 27,111. September 11.

Barrett Co. Distillation of tar. 27,392. September 13. (United States, September 13, 1929.)

Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of soot or carbon black. 26,919. September 9.

— Disinfection and destruction of insect pests. 27,082. September 10. (June, 1924.)

—— Manufacture of azo dyestuffs. 27,354. September 12.

—— Electrodes. 27,355. September 12.

Chemieverfahren Ges. Production of sodium nitrate. 27,327. September 12. (Germany, October 3, 1929.)

Coles, S. O., Cowper-. Protection of iron or steel from corrosion. 26,717. September 8.

—— Manufacture of white lead pigment. 26,845. September 9.

Coley, H. E. Manufacture of tin. 26,912. September 9.

—— Manufacture of zinc. 26,913. September 9.

Collett, E. Production of nitric acid. 26,831. September 8.

Du Pont de Nemours and Co., E. I., and Imperial Chemical Industries, Ltd. Manufacture of rubber. 27,037. September 10.

—— Manufacture of cellulose ethyl ether. 27,141. September 11.

—— Manufacture of intermediates for dyes. etc. 27,267. September 12.

—— Manufacture of piperidine pentamethylenedithiocarbamate. 27,268. September 12.

Durant, H. T., and Picard, H. F. K. Recovery of values from cyanide solutions. 26,825. September 8.

Gill, H. A., and Saline Ludwigshalle. Production of aluminium fluoride-alkali fluoride double compounds. 26,800. September 8.

Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Manufacture of derivatives of naphthalene-1 : 4 : 5 : 8-tetracarboxylic acid. 26,785. September 8.

—— Manufacture of solutions of fibroin. 27,010. September 10.

—— Manufacture of vat dyestuffs. 27,329. September 12.

I.G. Farbenindustrie Akt.-Ges and Johnson, J. Y. Purification of oils, fats, etc. 26,727, 26,728. September 8.

—— Manufacture of vat dyestuffs. 26,761. September 8.

—— Manufacture of condensation products containing nitrogen, 26,762. September 8.

—— Manufacture of porous building materials. 26,763. September 8.

—— Manufacture of acetaldehyde from acetylene. 26,764. September 8.

—— Manufacture of chloropropionic esters. 26,765. September 8.

—— Manufacture of derivatives of the 1.2-benzanthraquinone series. 26,766. September 8.

—— Manufacture of vat dyestuffs of the 1.2-benzanthraquinone series. 26,767. September 8.

—— Apparatus for manufacture of carbon black. 26,768. September 8.

—— Manufacture of viscous cellulose. 26,879. September 9.

—— Agents for treatment of vegetable, animal, etc., materials. 26,880. September 9.

—— Improving cellulose. 26,881. September 9.

—— Manufacture of colour lakes. 26,882. September 9.

—— Improving hydrocarbons. 26,883. September 9.

—— Manufacture of hydroxy alkyl amines. 26,884. September 9.

—— Manufacture of waxy products. 27,149. September 11.

—— Manufacture of vat dyestuffs. 27,329. September 12.

I.G. Farbenindustrie Akt.-Ges. Separating active substances of posterior lobe of the hypophysis. 26,789. September 8. (Germany, September 7, 1929.)

—— Manufacture of artificial masses. 26,790. September 8. (Germany, September 7, 1929.)

—— Manufacture of azo-dyestuffs. 27,078. September 10. (Germany, September 11, 1929.)

—— Removal of calcium chloride liquor adhering to calcium hypochlorite. 27,147. September 11. (Germany, September 17, 1929.)

—— Producing resists under vat colours. 27,168. September 11. (Germany, September 11, 1929.)

—— Manufacture of organic arsenic compounds. 27,332. September 12. (Germany, September 13, 1929.)

Imperial Chemical Industries, Ltd. Manufacture of rubber. 26,749. September 8. (United States, September 9, 1929.)

—— Collection of sulphur. 26,905. September 9.

—— Oily products, etc. 27,033. September 10.

—— Artificial resinous substances. 27,034. September 10.

Imperial Chemical Industries, Ltd., Rodd, E.H., and Watts, G. E. Basic dyestuffs. 27,035. September 10.

—— Preservation of oxidisable salts and esters of fatty acids. 27,036. September 10. (United States, September 10, 1929.)

—— Manufacture of rubber. 27,269. September 12. (United States, September 27, 1929.)

—— Manufacture of rubber. 27,270. September 12. (United States, September 17, 1929.)

—— Coating compositions. 27,271. September 12. (United States, September 27, 1929.)

—— Manufacture of sulphuric acid. 27,272. September 12. (United States, September 13, 1929.)

Melhuish, A. E., and Resinous Products and Chemical Co. Production of heavy metal salts of organic derivatives of ketobenzoic acids. 26,939. September 9.

—— Driers for oils, paints, etc. 26,940. September 9.

Silica Gel Corporation and Wade, H. Manufacture of metal oxide absorbent gels. 27,201. September 11.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.
ACID, CHROMIC.—1s. 0½d. per lb. d/d U.K.
ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.
ACID NITRIC, 80° Tw.—Spot £20 to £25 per ton, makers' works according to district and quality.
ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
AMMONIA (ANHYDROUS).—Spot, 11d. per lb., d/d in cylinders.
AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.
BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.
BLEACHING POWDER, 35/37%.—Spot, £7 10s. per ton d/d station in casks, special terms for contracts.
BORAX, COMMERCIAL.—Crystals, £13 10s. per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards).
CALCIUM CHLORIDE (SOLID), 70/75%.—Spot, £4 15s. to £5 5s. per ton d/d in drums.
CHROMIUM OXIDE.—9½d. and 10d. per lb. according to quantity d/d U.K.
CHROMETAN.—Crystals, 3¼d. per lb. Liquor, £18 10s. per ton d/d U.K.
COPPER SULPHATE.—£25 to £25 10s. per ton.
METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 7d. to 1s. 11d. per gall. pyridinised industrial, 1s. 9d. to 2s. 1d. per gall.; mineralised 2s. 8d. to 2s. 11d. per gall. 64 O.P., 1d. extra in all cases. Prices according to quantity.
NICKEL SULPHATE.—£38 per ton d/d.
NICKEL AMMONIA SULPHATE.—£38 per ton d/d.
POTASH CAUSTIC.—£30 to £33 per ton.
POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4½d. per lb. nett d/d U.K., discount according to quantity; ground ½d. per lb. extra.
POTASSIUM CHLORATE.—3¾d. per lb., ex-wharf, London, in cwt. kegs.
POTASSIUM CHROMATE.—8d. per lb. d/d U.K.
SALAMMONIAC.—Firsts lump, spot, £42 10s. per ton d/d station in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.
SALT CAKE, UNGROUND.—Spot, £3 7s. 6d. per ton d/d station in bulk.
SODA ASH, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.
SODA CAUSTIC, SOLID, 76/77°E.—Spot, £14 10s. per ton, d/d station.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2 cwt. bags.
SODIUM ACETATE 97/98%.—£21 per ton.
SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.
SODIUM BICHROMATE CRYSTALS.—3⅝d. per lb. nett d/d U.K., discount according to quantity. Anhydrous ⅝d. per lb. extra.
SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.b. London.
SODIUM CHLORATE.—2⅝d. per lb.
SODIUM CHROMATE.—3½d. per lb. d/d U.K.
SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.
SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.
SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.
SODIUM SULPHIDE SOLID, 60/62%.—Spot, £10 5s. per ton d/d station in drums. Crystals—Spot, £7 10s. per ton d/d station in casks.
SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station in bags.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—6d. to 7½d. per lb. Crude 60's 1s. 4½d. to 2s. per gall. August/December.
ACID CRESYLIC 99/100.—2s. 2d. to 2s. 3d. per gall. B.P., 5s. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Refined, 2s. 7d. to 2s. 10d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 1s. 11d. to 2s. Dark, 1s. 6d. to 1s. 7d.
ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.
ANTHRACENE OIL, STRAINED, 1080/1090.—4¾d. to 5½d. per gall. 1100, 5½d. to 6d. per gall.; 1110, 6d. to 6½d. per gall. Unstrained (Prices only nominal).
BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall.; Pure, 1s. 10d. to 1s. 11d. per gall.
TOLUOLE.—90%, 1s. 9d. to 1s. 10d. per gall. Pure, 1s. 11d. to 2s. 2d. per gall.
XYLOL.—1s. 5d. to 1s. 10d. per gall. Pure, 1s. 8d. to 2s. 1d. per gall.
CREOSOTE.—Cresylic, 20/24%, 6¾d. to 7d. per gall.; Heavy, for Export, 6½d. to 6¾d. per gall. Home, 4d. per gall. d/d. Middle oil, 4½d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 1½d. to 1¾d. per gall. ex works. Salty, 7½d. per gall.
NAPHTHA.—Crude, 8½d. to 8¾d. per gall. Solvent, 90/160, 1s. 3d. to 1s. 3½d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 6d. per gall. Solvent 90/190, 11d.. to 1s. 2½d. per gall.
NAPHTHALENE, CRUDE.—Drained Creosote Salts, £3 to £4 per ton. Whizzed, £4 to £5 per ton. Hot pressed, £8 per ton.
NAPHTHALENE.—Crystals, £10 per ton. Purified Crystals, £14 10s. per ton. Flaked, £11 per ton.
PITCH.—Medium soft, 46s. to 47s. 6d. per ton, f.o.b., according to district. Nominal.
PYRIDINE.—90/140, 3s. 6d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy prices only nominal.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:
ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.
ACID ANTHRANILIC.—6s. per lb. 100%.
ACID GAMMA.—Spot, 3s. 9d. per lb. 100% d/d buyer's works.
ACID H.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 5d. per lb. 100% d/d buyer's works.
ACID NEVILLE AND WINTHER.—Spot, 2s. 7d. per lb. 100% d/d buyer's works.
ACID SULPHANILIC.—Spot, 8½d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8½d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8½d. per lb. d/d buyer's works.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra, d/d buyer's works.
BENZIDINE BASE.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.
BENZOIC ACID.—Spot, 1s. 8½d. per lb. d/d buyer's works.
o-CRESOL 30/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.
m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.
p-CRESOL 34·5° C.—1s. 9½d. per lb., in ton lots.
DICHLORANILINE.—1s. 10d. per lb. f.o.r. works.
DIMETHYLANILINE.—Spot, 1s. 8d. per lb., drums extra d/d buyer's works.
DINITROBENZENE.—8d. per lb.
DINITROCHLORBENZENE.—£74 per ton d/d.
DINITROTOLUENE.—48/50° C., 7½d. per lb.; 66/68° C., 9d. per lb. f.o.r. works.
DIPHENYLAMINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
a-NAPHTHOL.—Spot, 1s. 11d. per lb. d/d buyer's works.
B-NAPHTHOL.—Spot, £65 per ton in 1 ton lots, d/d buyer's works.
a-NAPHTHYLAMINE.—Spot, 1s. per lb. d/d buyer's works.
B-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—5s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 6½d. per lb, 5-cwt. lots, drums extra, d/d buyer's works.
NITRONAPHTHALENE.—9d. per lb.
R. SALT.—Spot, 2s. per lb. 100% d/d buyer's works.
SODIUM NAPHTHIONATE.—Spot, 1s. 6½d. per lb. 100% d/d buyer's works.
o-TOLUIDINE.—Spot, 8d. per lb., drums extra, d/d buyer's works.
p-TOLUIDINE.—Spot, 1s. 9d. per lb. d/d buyer's works.
m-XYLIDINE ACETATE.—3s. 1d. per lb. ex works.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.
ACETONE.—£78 per ton.
CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.
IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.
WOOD CREOSOTE.—1s. 9d. per gall., unrefined.
WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d per gall. Solvent, 4s. to 4s. 3d. per gall.
WOOD TAR.—£3 10s. to £4 10s. per ton
BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 2d. per lb., according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.
ARSENIC SULPHIDE, YELLOW.—1s. 8d. to 1s. 10d. per lb.
BARYTES.—£5 10s. to £7 per ton, according to quality.
CADMIUM SULPHIDE.—4s. 10½d. to 5s. 3d. per lb.
CARBON BISULPHIDE.—£26 to £28 per ton, according to quantity; drums extra.
CARBON BLACK.—3⅞d. to 4 1/16d. per lb., ex wharf.
CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—2s. 9d. per lb.

LITHOPONE, 30%.—£20 to £22 per ton.

SULPHUR.—£9 10s. to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£55 to £60 per ton, according to quantity.

ZINC SULPHIDE.—8d. to 11d. per lb

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£37 per ton, for ½ to 1-ton lots, delivered, barrels free.

ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 11d. per lb., according to quantity.

ACID, BENZOIC B.P.—2s. to 2s. 3d. per lb., for synthetic product, according to quantity. Solely ex Gum, 1s. 3d. to 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £31 per ton; powder, £32 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—1s. 6d. to 1s. 6¾d. per lb., less 5%.

ACID, GALLIC.—2s. 11d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 8d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—1s. 0½d. per lb., less 5%.

ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities

AMIDOL.—7s. 6d. to 9s. per lb., d/d.

AMIDOPYRIN.—7s. 9d. to 8s. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—9s. per oz.

BARBITONE.—5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—3s. to 3s. 3d. per lb.

BISMUTH CARBONATE.—6s. 6d. per lb.

BISMUTH CITRATE.—6s. 9d. per lb.

BISMUTH SALICYLATE.—6s. 7d. per lb.

BISMUTH SUBNITRATE.—5s. 6d. per lb.

BISMUTH NITRATE.—Cryst. 4s. 4d. per lb.

BISMUTH OXIDE.—8s. 6d. per lb.

BISMUTH SUBCHLORIDE.—8s. per lb.

BISMUTH SUBGALLATE.—6s. 9d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.

BORAX B.P.—Crystal, £21 10s. per ton; powder, £22 per ton; For one ton lots and upwards. Packed in 1 cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 1s. 9d. per lb.; potassium, 1s. 5½d. per lb.; granular, 1s. 5d. per lb.; sodium, 1s. 8d. per lb. Prices for 1 cwt. lots.

CALCIUM LACTATE.—B.P., 1s. 1½d. to 1s. 3d. per lb., in 1 cwt. lots.

CAMPHOR.—Refined flowers, 3s. to 3s. 2d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.

CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.

CREOSOTE CARBONATE.—6s. per lb.

ETHERS.—S.G. ·730—1s. to 1s. 1d. per lb., according to quantity; other gravities at proportionate prices.

FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.

GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.

HEXAMINE.—2s. 3d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 3s. per gall.

HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8½d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.

IRON AMMONIUM CITRATE.—B.P., 2s. 5d. per lb. for 28 lb. lots. Green, 3s. 1d. per lb., list price. U.S.P., 3s. 3d. per lb. list price.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8¼d. to 8¾d. per oz., according to quantity.

MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 15s. 6d. per lb. net; Synthetic, 9s. 6d. to 11s. per lb.; Synthetic detached crystals, 9s. 6d. to 11s. per lb., according to quantity; Liquid (95%), 9s. per lb.

MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb

METHYL SULPHONAL.—18s. 6d. to 20s. per lb.

METOL.—9s. to 11s. 6d. per lb. British make.

PARAFORMALDEHYDE.—1s 9d. per lb. for 100% powder.

PARALDEHYDE.—1s. 4d. per lb.

PHENACETIN.—3s. 9d. to 4s. 1d. per lb.

PHENAZONE.—5s. 6d. per lb.

PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—90s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P.C., 2s. 3d. per lb. in 28 lb. lots. Smaller quantities 1d. per lb. more.

POTASSIUM FERRICYANIDE.—1s. 7½d. per lb., in 125 lb. kegs.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1 cwt. kegs included f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins

RESORCIN.—2s. 10d. to 3s. per lb., spot.

SACCHARIN.—43s. 6d. per lb.

SODIUM BENZOATE B.P.—1s. 9d. per lb. for 1-cwt. lots.

SODIUM CITRATE, B.P.C., 1911, AND U.S.P. VIII.—1s. 11d. per lb., B.P.C. 1923, and U.S.P. IX—2s. 3d. per lb. Prices for 28 lb. lots. Smaller quantities 1d. per lb. more.

SODIUM FERROCYANIDE.—4d. per lb., carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—95s. to 100s. per cwt. net. Crystals, 2s. 6d. per cwt. extra.

SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 3d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.

SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.

SULPHONAL.—9s. 6d. to 10s. per lb.

TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 2s. per lb.

THYMOL.—Puriss, 8s. 3½d. to 9s. 2d. per lb., according to quantity. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—12s. per lb.

AMYL ACETATE.—2s. 6d. per lb.

AMYL BUTYRATE.—5s. per lb.

AMYL CINNAMIC ALDEHYDE.—10s. per lb.

AMYL SALICYLATE.—2s. 6d. per lb.

ANETHOL (M.P. 21/22° C.).—7s. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 10d. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 10d. per lb.

BENZYL BENZOATE.—2s. 6d. per lb.

CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.

COUMARIN.—11s. per lb.

CITRONELLOL.—8s. per lb.

CITRAL.—8s. per lb.

ETHYL CINNAMATE.—6s. 6d. per lb.

ETHYL PHTHALATE.—2s. 9d. per lb.

EUGENOL.—9s. 3d. per lb.

GERANIOL (PALMAROSA).—17s. per lb.

GERANIOL.—7s. 6d. to 10s. per lb.

HELIOTROPINE.—6s. per lb.

ISO EUGENOL.—11s. 6d. per lb.

PHENYL ETHYL ACETATE.—11s. per lb.

PHENYL ETHYL ALCOHOL.—9s. per lb.

RHODINOL.—46s. per lb.

SAFROL.—2s. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—13s. to 15s. per lb. Ex Guaiacol.—12s. to 13s. 9d. per lb.

Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. per lb.

ANISE OIL.—No supplies available on spot.

BERGAMOT OIL.—10s. per lb.

BOURBON GERANIUM OIL.—17s. 6d. per lb.

CAMPHOR.—Brown, 1s. 9d. per lb.

CANANGA.—Java, 9s. per lb.

CASSIA OIL, 80/85%.—4s. 6d. per lb.

CINNAMON OIL LEAF.—6s. 9d. per oz.

CITRONELLA OIL.—Java, 2s. 5d. per lb., pure, Ceylon, 2s. 3d. per lb., c.i.f. U.K. port.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 9d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent aud impartial opinions.

London, September 18, 1930.

THE market has undergone very little alteration since our last report and prices continue much as they were. Export business is showing signs of broadening.

General Chemicals

ACETONE.—Conditions remain firm at £70 10s. to £80 per ton, according to quantity, and there is a fairly satisfactory demand.

ACID ACETIC.—In good request, and the market is now settled at £36 5s. to £38 5s. for technical 80% and £37 5s. to £39 5s. for pure 80%, according to quantity, delivered buyer's works.

ACID CITRIC.—Only a small demand and price is quoted easy at about 1s. 6¼d. per lb., less 5%.

ACID LACTIC.—Unchanged and in a little better request at £41 to £42 per ton for the 50% by weight, pale quality.

ACID OXALIC.—Continues to be in good inquiry, and the market is firm at £30 7s. 6d. to £32 per ton, according to quantity.

ACID TARTARIC.—The market is still rather slack, and the price is quoted easy at about 1s. 0¾d. per lb., less 5%.

ALUMINA SULPHATE.—Demand has been brisker than for some time, and price is firm at £8 to £8 15s. per ton for the 17/18% iron free quality.

ARSENIC.—Much firmer conditions are now ruling and there is a fairly good demand with some of the producers fully engaged for a few months ahead. Price is firm at about £16 to £16 10s. per ton, free on rails at the mines.

CREAM OF TARTAR.—In steady request at about 87s. 6d. per cwt., ex warehouse London.

COPPER SULPHATE.—More inquiries are now coming to hand from certain markets, and price is steady at about £21 to £21 10s. per ton, free on rails London.

FORMALDEHYDE.—The market is steady at about £32 per ton, ex wharf London, for 40% by volume, and there is a fairly good demand.

LEAD ACETATE.—Prices are unchanged at about £40 per ton for white and £39 per ton for brown, with the product in a little better request.

LEAD NITRATE.—Unchanged at about £29 10s. to £30 per ton, and in fair request.

LITHOPONE.—The market is unchanged at £19 15s. to £23 per ton, according to grade and quantity, and there is a steady demand.

CARBONATE OF POTASH.—Firm at £28 to £29 per ton for the 96/98% arsenic free quality.

PERMANGANATE OF POTASH.—B.P. needle crystals are quoted at 5¼d. per lb., and there is a good demand.

PRUSSIATE OF POTASH.—The market is very firm at £63 10s. to £65 10s. per ton, with rather more inquiry being received.

BICHROMATE OF SODA.—Conditions are unchanged and there is a steady market at 3⅜d. per lb., with the usual discounts for contracts.

SODIUM HYPOSULPHITE.—Commercial quality is still in rather slow demand, with price steady at £8 10s. per ton, and photographic crystals in fairly brisk request at about £14 15s. per ton.

SULPHIDE OF SODIUM.—Unchanged at £10 5s. to £11 5s. per ton for solid and £11 5s. to £12 5s. per ton for broken, according to quantity, carriage paid, and there is a steady demand.

TARTAR EMETIC.—Conditions have been a little better, and price is steady at about 11d. per lb.

ZINC SULPHATE.—In a little better request, with the market unchanged at £12 10s. per ton.

Coal Tar Products

The market for coal tar products is still very dull. Prices remain unchanged, and there is still a lack of inquiry.

MOTOR BENZOL.—Unchanged at about 1s. 5½d. to 1s. 6½d. per gallon, f.o.r.

SOLVENT NAPHTHA.—Quoted at about 1s. 2½d. to 1s. 3d. per gallon.

HEAVY NAPHTHA.—Remains at about 1s. 1d. per gallon, f.o.r.

CREOSOTE OIL.—Remains at 3d. to 3¼d. per gallon, f.o.r. in the North, and at 4d. to 4½d. per gallon in London.

CRESYLIC ACID.—Unchanged at 2s. per gallon for the 98/100% quality, the dark quality 95/97% being quoted at 1s. 10d. per gallon.

NAPHTHALENES.—The firelighter quality is offered at £3 10s. to £3 15s. per ton, the 74/76 quality at about £4 to £4 5s. per ton, and the 76/78 quality at about £5 per ton.

PITCH.—Obtainable at a nominal figure of 37s. 6d. to 42s. 6d. per ton, f.o.b. East Coast port.

The following additional prices have been received :—

Carbolic Acid.—Prices are unchanged at those previously reported, namely, 7d. to 7½d. per lb. according to quantity.

Cresylic Acid.—No change.

Aspirin.—No change.

Pyridine.—Seems easier, 90/160 being obtainable at 3s. 6d to 4s. according to quantity.

Methyl Salicylate.—Is unchanged at 1s. 3d. to 1s. 5d. per lb.

Salicylic Acid, B.P.—1s 5d. to 1s. 8d. per lb. according to quantity.

Phenolphthalein.—5s. 11d. to 6s. 1½d. per lb.

Nitrogen Fertilisers

Sulphate of Ammonia.—Export.—The market remains quiet but firm at £7 to £7 5s. per ton, f.o.b. U.K. port, in single bags, for prompt shipment. It is expected that as the consuming season grows nearer, prices will tend to advance. *Home.*—There is very little interest in the home market, except that some fertiliser manufacturers have purchased considerable quantities.

Nitrate of Soda.—The nitrate of soda prices appear to be high in certain markets compared with sulphate of ammonia, nevertheless certain large brokers have commenced to cover their requirements for the season. It remains to be seen whether the price scales will operate throughout the whole season. It is understood that the producers are giving most of their large buyers a fall clause in the event of any reduction taking place.

Latest Oil Prices

LONDON, September 17.—LINSEED OIL closed quieter at irregular prices. Spot, ex mill, £31 10s.; September, £28 15s.: October-December, £27 10s.; January-April, £26 7s. 6d., naked. RAPE OIL was slow. Crude, extracted, £32 10s.; technical refined, £34, naked, ex wharf. COTTON OIL was dull. Egyptian, crude, £26 10s.; refined common edible, £32; deodorised, £34, naked, ex mill. TURPENTINE was quiet and 3d. per cwt. lower. American, spot, 35s. 3d.; October-December, 35s. 6d.; January-April, 37s. 3d.

HULL.—LINSEED OIL, naked, closed for spot at £31 15s.; September, £30 5s.; October-December, £28 10s.; January-April, £27 12s. 6d. COTTON OIL.—Naked, Egyptian, crude, spot, £25 10s.; edible, refined, spot, £29 5s.; technical, spot, £29 5s.; deodorised, spot, £31 5s. PALM KERNEL OIL.—Crude, naked, 5½ per cent., spot, £26. GROUNDNUT OIL.—Crushed-extracted, spot, £30; deodorised, spot, £34. SOYA OIL.—Extracted, spot, and crushed, spot, £27 5s.; deodorised, spot, £30 15s. RAPE OIL.—Crushed-extracted, spot, £34; refined, spot, £36. CASTOR AND COD OIL, quiet at late rates. TURPENTINE, spot, 38s. per cwt.

Scottish Coal Tar Products

MORE optimism is being shown in the by-products market and this is having the effect of steadying prices, but so far no increase has taken place. Cresylic acid is reckoned to be at its lowest, but stocks continue heavy.

Cresylic Acid.—While no alteration can be reported in values, the market is steadier. Pale, 99/100%, 1s. 9½d. to 1s. 10½d. per gallon; pale, 97/99%, 1s. 8½d. to 1s. 9½d. per gallon; dark, 97/99%, 1s. 7½d. to 1s. 8½d. per gallon; high boiling, 1s. 9d. to 1s. 11d. per gallon; all f.o.r. in bulk.

Carbolic Sixties.—The nominal value is 2s. to 2s. 2d. per gallon ex makers' works.

Creosote Oil.—Trading is regular, but in comparatively small quantities. Specification oil, 2¾d. to 3¼d. per gallon; gas works ordinary, 3d. to 3¼d. per gallon; washed oil, 3d. to 3½d. per gallon; all in bulk f.o.r. works.

Coal Tar Pitch.—Inquiries are gradually increasing in number, but few orders are reported. The export price is 45s. to 47s. 6d. per ton f.a.s. Glasgow, and home value is about 47s. 6d. per ton ex works.

Blast Furnace Pitch.—Controlled prices remain at 30s. per ton f.o.r. works for home trade, and 35s. per ton f.a.s. Glasgow for export.

Refined Coal Tar.—The season is closing with large stocks in hand. Quotations remain steady at 3d. to 3¼d. per gallon in buyers' pack ages at works.

Blast Furnace Tar.—Dull at 2¾d. per gallon f.o.r.

Crude Naphtha.—There is a steady demand at 4d. to 4¼d. per gallon ex makers' works in bulk.

Water White Products.—Motor benzole continues active at 1s. 5½d. to 1s. 6d. per gallon, but naphthas are quiet at 1s. 2½d. to 1s. 3½d. per gallon for 90/160 quality and 1s. to 1s. 1d. per gallon for 90/190 quality, all in bulk free on rails.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing this firm's independent and impartial opinions.*

Glasgow, September 16, 1930.

CONTINUED improvement is recorded in the Scottish heavy chemical market. Home inquiries are active, and for increasing tonnage price changes show a definitely rising market.

ACETONE.—B.G.S.—£71 10s. to £80 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID, ACETIC.—Prices ruling are as follows: Glacial, 98/100%, £47 to £58 per ton; pure, £37 5s. per ton; technical, 80%, £36 5s., delivered in minimum 1 ton lots.

ACID, BORIC.—Granulated commercial, £22 per ton; crystals, £23; B.P. crystals, £31 per ton; B.P. powder, £32 per ton, in 1 cwt. bags, delivered free Great Britain in one ton lots and upwards.

ACID, HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy. Dearsenicated quality, 5s. per carboy, ex works, full wagon loads.

ACID, NITRIC, 80° QUALITY.—£23 per ton, ex station, full truck loads.

ACID, OXALIC.—98/100%.—On offer at the same price, viz.: 3½d. per lb., ex store. On offer from the Continent at 3¼d. per lb., ex wharf.

ACID, SULPHURIC.—£3 2s. 6d. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID, TARTARIC, B.P. CRYSTALS.—Quoted 1s. 1d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. 2½d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £8 15s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton., c.i.f. U.K. ports. Crystal meal, about 2s. 6d. per ton less.

AMMONIA ANHYDROUS.—Quoted 10½d. per lb., containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material obtainable at round about £30 per ton, ex whart. On offer for shipment from China at about £29 per ton, c.i.f. U.K.

ARSENIC, WHITE POWDERED.—Quoted £18 per ton, ex wharf, prompt shipment from mines. Spot material still on offer at £19 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports. For Continental material our price would be £10 per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 15s. per ton, delivered in minimum 4 ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price £4 15s. to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £4 15s. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—At about £3 15s. per ton, f.o.r. works, or £4 12s. 6d. per ton, f.o.b U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £33 per ton, ex store. Continental on offer at about £32 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 per ton, ex wharf.

LEAD, RED.—Price now £33 per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £40 per ton, c.i.f. U.K. ports.

LEAD, ACETATE.—White crystals quoted round about £39 to £40 per ton ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE.—GROUND CALCINED.—Quoted £9 per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 o.p. quoted 1s. 8d. per gallon less 2½% delivered.

POTASSIUM BICHROMATE.—Quoted 4½d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer, £25 10s. per ton ex store. Offered from the Continent at £24 15s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100% POWDER.—Quoted £26 5s. per ton ex store; crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £20 17s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb. ex store. Offered for prompt delivery from the Continent at about 6½d. per lb. ex wharf.

SODA CAUSTIC.—Powdered 98/99%, £17 10s. per ton in drums, £18 15s. in casks. Solid 76/77% £14 10s. per ton in drums, £14 12s. 6d. per ton for 70/72% in drums, all carriage paid, buyer's station, minimum four-ton lots. For contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅜d. per lb., delivered buyer's premises, with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powdered or pea quality, 27s. 6d. per ton extra. Light soda ash, £7 13s. per ton, ex quay, minimum four-ton lots, with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum four-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum four-ton lots.

SODIUM NITRATE.—Chilean producers now offer at £10 2s. per ton, carriage paid, buyer's sidings, minimum six-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5½d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices, 55s. per ton, ex works; 57s. 6d. per ton, delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption: solid 61/62%, £10 per ton; broken, 60/62%, £11 per ton; crystals 30/32%, £8 2s. 6d. per ton, all delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra. Crystals 2s. 6d. per ton extra.

SULPHUR.—Flowers, £12 per ton; Roll, £10 10s. per ton; Rock, £9 5s. per ton; Ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £12 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

South Wales By-Products

SOUTH Wales by-product activities continue to be unsatisfactory. The demand for most products remains slow and sporadic, and the immediate outlook is not bright. Pitch continues to be a slow feature, stocks being well in excess of demands. Values are nominal round about 45s. per ton f.o.b. Solvent naphtha has a moderate call at from 1s. 3½d. per gallon, but heavy naphtha has practically no demand at from 11d. to 1s. 1d. per gallon. Creosote is slightly more active at about 3⅜d, while motor benzol continues to have a fair call with quotations unchanged.

Sulphuric Acid for Accumulators

Air Ministry Specification

PROVISIONAL Air Ministry aircraft specification No. D.T.D.154 is one of a series issued by the Air Ministry either to meet a limited requirement not covered by any existing British Standard Specification or to serve as a basis for inspection of material whose properties and uses are not sufficiently developed to warrant submission to the British Engineering Standards Association for standardisation.

Description.—The material shall be a clear, colourless liquid, free from visible impurities.

Specific Gravity.—The specific gravity at 15° C. shall be 1·270 when compared with water at the same temperature.

Impurities.—The impurities present in the material shall not exceed the following amounts :—

	Weight in grammes per 100 c.c.
Suspended matter	Nil
Organic matter in any form	0·0025
Manganese	0·0005
Arsenic	0·0005
Copper	0·001
Sulphurous Acid	0·001
Nitrogen, as Nitrates or Nitrites	0·001
Chlorine	0·001
Iron	0·0025
Ammonia	0·01
Fixed residue on evaporation	0·06

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, September 18, 1930.

Trading conditions in the chemical market during the past week can at the best be described as quiet, with no important weight of actual business placed, although, on the whole, in the case of some of the principal lines, deliveries against contracts continue to be on a rather better scale than during August. Prices generally are steady at the moment, but there seems to be a certain amount of mistrust in this respect on the part of consumers. At all events, there is little disposition to venture far ahead when entering into commitments, most of the current business being for early deliveries.

Heavy Chemicals

No more than a quiet trade is going through in the case of phosphate of soda, though values in this section are maintained on the basis of £11 per ton for the dibasic material. Caustic soda prices retain their firmness at from £12 15s. to £14 per ton, according to strength and in contracts, and business is reported to be on moderate lines. Not much buying interest is being shown in sulphide of sodium at the moment, but there has been little change on balance in the basis of prices, the commercial quality being on offer at £7 10s. per ton and the 60/65 per cent. concentrated solid material at about £8 10s. There is a fair demand about for alkali, values of which are firm at £6 per ton, with bicarbonate of soda in a similar position at round £10 10s. Prussiate of soda has only been in relatively quiet request during the past week, but prices keep up at from 4⅞d. to 5¼d. per lb., according to quantity. Hyposulphite of soda has been moving rather slowly, with supplies of the photographic material obtainable at round £15 per ton and of the commercial grade at £9 5s. A moderate business is reported in respect of saltcakes, values of which range from about £2 15s. to £3 per ton. With regard to bichromate of soda, prices are maintained on the basis of 3⅜d. per lb. less 1 to 3½ per cent. according to quantity, and a quietly steady trade is being put through. Chlorate of soda is quiet, but unchanged in price at about £24 10s. per ton.

Inquiry in respect of carbonate of potash is rather subdued, and at from £24 10s. to £25 per ton, values are not too strong. A moderate business is going through in yellow prussiate of potash, and quotations are firm at from 6⅝d. to 7¼d. per lb., according to quantity. Offers of bichromate of potash continue on the basis of 4½d. per lb., less discounts of 1 to 3½ per cent., with buying interest on moderate lines. Not much business is offering in the case of caustic potash, but prices are about unchanged on the week at £30 per ton. A quiet movement is reported in permanganate of potash, with the commercial grade selling at about 5¼d. per lb. and the B.P. at 5½d. Chlorate of potash is fairly steady at round £25 10s. per ton, with sales on moderate lines.

The recent firmness in arsenic continues, and up to £16 10s. per ton at the mines is now being quoted for white powdered, Cornish makes. There is a moderate demand about for sulphate of copper, to-day's values of which range from £22 to £22 10s. per ton, f.o.b. Inquiry for the lead compounds is rather quiet at the moment, but quotations keep up at about £35 per ton for brown acetate and £36 for white, with nitrate on offer at round £29 10s. The acetates of lime are steady at £7 10s. per ton for brown and £14 10s. for grey, but business this week has been on a restricted scale.

Acids and Tar Products

A fair trade is going through in acetic acid, quotations for which are well held at about £37 per ton for the 80 per cent. commercial product and from £47 to £51, according to quantity, for the glacial. The demand for citric acid is quiet just now, and at 1s. 6d. to 1s. 6¼d. per lb. prices are hardly so steady as they were. Tartaric acid is slow at from 11½d. to 1s. per lb. Oxalic acid is in moderate enquiry, with current values at round £1 11s. 6d. per cwt., ex store.

Sales of pitch are only of relatively limited extent, with offers at round 45s. per ton, f.o.b. A quiet trade is passing in creosote oil, and prices are fairly steady at 3¼d. to 4¼d. per gallon, naked, according to quality. Carbolic acid crude is well held at about 2s. 2d. per gallon, naked, for 60's material, with crystals in fair request at 6¼d. to 7d. per lb., f.o.b. Solvent naphtha is maintained at round 1s. 2d. per gallon, naked, and a moderate business is reported.

Company News

Reckitt and Sons, Ltd.—The directors announce a second interim dividend on account of the current year of 3¾ per cent., less tax, on the ordinary shares, payable on October 1.

American Cyanamid Co.—Consolidated earnings of the company and subsidiaries for the year to June 30 last were $8,843,133 (against $3,259,312), the net income being $4,618,099 (against $2,328,928). The 1929-30 results include operating revenue for full year of companies acquired during fiscal year. The American Cyanamid's working profit was $7,513,517 (against $3,989,261). Surplus was $20,446,026, an increase of $15,961,195. This is composed of capital surplus of $17,245,281 and earned surplus of $3,200,744. Dividends for the year amounted to $3,569,527 (against $1,140,680) on 1,325,462 no par Common shares. During the year $13,615,191 was expended for new construction and acquisition of properties.

Staveley Coal and Iron Co., Ltd.—The profit for the year ended June 30 last, after providing for taxation and including dividends from subsidiary and other companies, amounts to £408,167, from which falls to be deducted £135,773 for depreciation and £6,300 for directors' fees and tax, leaving a net profit of £266,094, compared with $306,117 a year ago, the latter figure being arrived at before charging £40,000 for additions and renewals. Adding the amount brought forward, £111,162, there is an available balance of £377,256, in contrast with £420,430 last year. The year's distribution is to be 6 per cent., tax free, against 5 per cent., tax free, requring £203,121, compared with £169,268. After transferring to general reserve account the sum of £75,000, against £100,000, there remains to be carried forward a balance of £99,135.

New Chemical Trade Marks

Applications for Registration

These lists are specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to October 17, 1930.

Zerosel.

514,915. Class 1. Chemical substances, being compounds for the removal of hardness and iron compounds from water and salt for use in regenerating such substances. United Water Softeners, Ltd., Aldwych House, Aldwych, London, W.C.2; manufacturers. July 28, 1930. To be Associated with No. 368,828 (1965).

Gardinol.

514,729. Class 1. Chemical substances for use in the dyeing industry. H. Th. Böhme Aktiengesellschaft (a joint stock company organised under the laws of Germany), 29, Moritzstrasse, Chemnitz, Saxony, Germany; manufacturers. July 19, 1930. To be Associated with No. 514,730 (2,738), xlvii.

"C.A." Query

We receive so many inquiries from readers as to technical, industrial, and other points, that we have decided to make a selection for publication. In cases where the answers are of general interest, they will be published; in others, the answers will simply be passed on to the inquirers. Readers are invited to supply information on the subjects of the queries:—

148. (*Soap-making Machinery.*)—An inquirer in Nyasaland, who is interested in the nut-growing industry and has in view certain developments, desires to be put into touch with manufacturers of soap-making machinery, particularly machinery for the extraction of oil from ground nuts.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette, &c.

Companies Winding Up Voluntarily

ARCHD. J. FITZ, LTD. (C.W.U.V., 20/9/30.) By reason of its liabilities, September 6. W. L. Threlford, chartered accountant, 28A, Basinghall Street, London, E.C.2, appointed as liquidator.

PIONEER OILFIELDS, LTD. (C.W.U.V., 20/9/30.) By special resolution, September 5. G. Thompson, 20, Lawrence Lane, E.C.2, appointed as liquidator.

Receivership

RATINOL CO., LTD. (R., 20/9/30.) B. Bowles and J. Northam, of 6, Finsbury Square, E.C., were appointed receivers and managers on September 3, 1930, under powers contained in debenture bond dated November 28, 1928.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

LAGUNAS NITRATE CO., LTD., London, E.C. (M., 20/9/30.) Registered September 3, £59,470 debentures (secured by Trust Deed dated August 20, 1930); 1st general charge, except uncalled capital. *Nil. July 30, 1930.

RUSSIAN OIL PRODUCTS, LTD., London, E.C. (M., 20/9/30.) Registered September 3, assignment securing £200,000 to Saml. Montagu and Co., bankers; charged on book debts, etc., due or to become due to company from trade customers in Great Britain, etc. *Nil. January 14, 1930.

New Company Registered

UTILITIES IMPROVEMENTS, LTD. Registered as a "private" company on September 10. Nominal capital, £4,500 in 1s. shares. The objects are to acquire interests in any patents and the like for any invention relating to the production, treatment, manufacture, storage, distribution and use of sugar, and of any plant, machinery or apparatus in connection therewith; to carry out chemical, physical, mechanical or other scientific research or work of any kind, to establish workshops and laboratories, to manufacture and deal in machinery, welding and metal cutting plant, etc. A subscriber: W. Hann, 7, Shirley Road, Croydon.

New Benn Books

BOOKS announced for forthcoming publication by Ernest Benn, Ltd., include: *Arabia*, by H. St. John Philby, 18s.; *Alcyone*, by Eden Phillpotts, cloth 6s., edition de luxe 42s.; *Lovely Clay*, by Maysie Greig, 7s. 6d.; *Thou Hast a Devil*, by Ray Coryton Hutchinson, 7s. 6d.; *Unwillingly to School*, by Anne Allardice, 7s. 6d.; *Crime At Keepers*, by Thomas Cobb, 7s. 6d.; *The Spanish Virgin*, by V. S. Pritchett, 7s. 6d.; *The Man in Possession*, by H. M. Harwood, 5s.; *Forty Years at the Electrical Progress: The Story of the G.E.C.*, by Adam Gowans-Whyte, 5s.; *The Bijou Petrograd Calculator*, 1s. 6d.; *The New Hoppus's Measure*, 2s. 6d.

Brazil's Need for Sulphur

THERE is a considerable and growing demand for sulphur in Brazil to supply the needs of the sugar, textile, rubber, insecticide, match explosives and other industries. Import figures for the past five years in metric tons were: 1925, 6,838 tons; 1926, 3,923 tons; 1927, 6,589 tons; 1928, 9,805 tons; 1929, 8,749 tons. In 1928 this trade was divided, about 60 per cent. to the United States and 25 per cent. to Italy, but in 1929 the United States' share dropped to 47 per cent., Italy obtained 23 per cent., and Germany 13 per cent.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal" have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

AUSTRALIA.—An experienced commercial engineer, shortly going to Australia for a four or five years' business tour of the various States of the Commonwealth, is desirous of getting into touch with any British engineering or industrial manufacturers wishing to avail themselves of his services. (Ref. No. 255.)

CANADA.—A well-known firm of commission merchants handling white lead, dry colours, chemicals, laundry supplies and tanning materials desires to obtain British agencies for the sale of these commodities, on a commission or consignment basis, throughout Eastern Canada. They are also open for new lines. (Ref. No. 264.)

CUBA.—A firm in Havana wishes to obtain quotations for a regular two-monthly supply of 100 drums, each containing 50 to 55 gallons, of the following products: (1) Creosote oil (neutral tar-oil), 12 to 14 per cent. (2) Naphthalene oil (medium tar acid), 25 to 30 per cent. (3) Tar acid oil (crude phenic acid). The quotations should be f.o.b. England and also c.i.f. Havana. (Ref. No. 274.)

SOUTH AFRICA.—The South African Railways and Harbour Administration is calling for tenders, to be presented in Johannesburg by October 7, 1930, for the supply of raw and boiled linseed oil. (Tender No. 1751.) (Ref. B.X. 6,756.)

Tariff Changes

CHINA.—Regulations have been issued by the Chinese Ministry of Health for the control of the manufacture of, and trade in, "made-up" medicines, *i.e.*, those in which the single original chemical has been treated or combined with other chemicals to form a distinct drug, the term including "patent" medicines. The regulations provide that on the first introduction of the article into China, the manufacturer or importer must submit it to the Ministry of Health, together with full details as to composition, quality, weight, purposes, and efficacy, for investigation and approval. A statement in Chinese as to composition, uses, and approval for sale must be printed on the wrapper or contained in the package. A licence fee of 2 dollars (in addition to examiner's fee and stamp tax) is payable for a certificate of approval.

PORTUGAL.—Peroxide of hydrogen has been added to section No. 213 in the Customs tariff ("Minimum" duty 5 gold centavos per kilog.) This heading covers aqueous solutions of peroxide of hydrogen up to a concentration of 12 volumes. Solutions with a higher concentration will be dutiable at the rate of ½ gold centavo per volume per kilog. under the "Minimum" tariff, and three times that amount under the "Maximum" tariff. All clearances of oxygenated waters will be by declaration.

SYRIA.—Duty free admission will in future be allowed special chemical products for use as insecticides, provided an official analysis proves that they can be used for no other purpose.

Aluminium Compounds in France

THE French manufacture of aluminium compounds is not so important as might be expected, considering France's position as a producer of aluminium, reports the U.S. Assistant Trade Commissioner in Paris. The principal compound manufactured in France is aluminium sulphate, with smaller quantities of aluminium chloride, aluminium stearate, oleate, formate, and acetate.

There are three principal producers of aluminium sulphate—Pechiney, Saint-Gobain, and the Société Electro-Chimie. Of these three Pechiney accounts for about 75 per cent. of the production, which amounts to from 50,000 to 55,000 metric tons annually, according to estimates. Since production is mainly for use by the producers, the output is not known. Between these three concerns there is an entente covering sales and prices. The bulk of the exports is sulphate, the figures for which in 1929 declined to 23,000 tons from a previous three year average of nearly 30,000 tons.